

# Three recently erected Trichoptera families from South Africa, the Hydrosalpingidae, Petrothrincidae and Barbarochthonidae (Integripalpia: Sericostomatoidea)

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with

A cladistic analysis of character states in the twelve families  
here considered as belonging to the Sericostomatoidea

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## ABSTRACT

Three southern African families of Trichoptera, the Hydrosalpingidae, Petrothrincidae and Barbarochthonidae, erected recently (Scott, 1985) to accommodate the genera *Hydrosalpinx*, *Petrothrincus* and *Barbarochthon* (all Barnard 1934), are fully described, illustrated and discussed. As far as is known all three genera are endemic to South Africa and appear to be relicts of the Gondwanan south temperate fauna. They are largely confined to the western, southwestern and southern coastal folded belt. *Petrothrincus* and *Barbarochthon* have also been recorded from the eastern Cape Province and *Barbarochthon* from Natal.

Specific descriptions are given for the single species of *Hydrosalpinx* and *Barbarochthon*, and for the three species, one new, of *Petrothrincus*. A key to the species of *Petrothrincus* is given.

The three families are placed in the superfamily Sericostomatoidea Stephens 1836, *sensu* Weaver 1983 of the suborder Integripalpia.

Phylogenetic relationships of the twelve families considered to belong to the Sericostomatoidea are investigated using cladistic methods.

## INTRODUCTION

Several southern African genera of Trichoptera have presented difficulties in classification since their original description by Barnard (1934). These genera include *Rhoizema*, *Cheimacheramus*, *Petroplax* and *Barbarochthon*, all accommodated by him in the family Sericostomatidae Stephens 1836 (emend. McLachlan, 1874), in its old wide sense. Others are *Hydrosalpinx* and *Petrothrincus*, placed by Barnard under Aequipalpia near, but not in, the families Molannidae and Beraeidae. To Barnard's group Morse (1974) added a new genus *Aclosma* which he attributed to the Sericostomatidae *sensu stricto*. This genus he erected for his new species *A. bispinosa* from Natal. He believes that *Petroplax anomala* Barnard from the eastern Cape should also be included in his genus *Aclosma* (Morse *in litt.*, 15.xi.1974). The differences between *Aclosma* and *Petroplax* are small and *Aclosma* may prove to be a junior synonym. All the above genera appear to be endemic to South Africa and restricted mainly to the mountains of the coastal folded belt in the Cape Province. *Aclosma* and *Barbarochthon* have also been found in Natal.

Over the years most of the older genera have suffered various vicissitudes, taxonomically speaking. Barnard himself did not indicate to which of the then existing subfamilies he considered that *Rhoizema*, *Cheimacheramus*, *Petroplax* and *Barbarochthon* might belong. He did, however, comment that the family Sericostomatidae was a repository for a number of forms the systematic position of which was not clear. Shortly afterwards Lestage (1936), terming the Sericostomatidae *sensu lato* "this old curiosity shop" as had McLachlan earlier, suggested that *Rhoizema*, *Cheimacheramus* and *Petroplax* might belong to the Sericostomatinae but remarked that the whole family diagnosis needed revision with the creation of a special division for *Petrothrincus* and *Hydrosalpinx*. He considered that *Barbarochthon* was more likely to belong to the Brachycentrinae than to the Sericostomatinae on account of the structure of the maxillary palps. Ulmer (1955) followed Lestage in placing *Barbarochthon* under Brachycentrinae with a query but remarked that the immature stages did not fit well there. Fischer (1970) allocated it to the Brachycentridae without comment. Marlier (1962) reunited all four genera (*Rhoizema*, *Petroplax*, *Cheimacheramus* and *Barbarochthon*) in the Sericostomatinae as an expedient, though artificial, temporary measure pending revision when greater knowledge should become available.

After consultation with Dr G.B. Wiggins and comparison with Canadian material kindly sent by

him, it was decided that *Rhoizema*, *Cheimacheramus*, *Petroplax* and *Aclosma* could well be accommodated in the Sericostomatidae *sensu stricto* as at present understood, together with *Aselas* Barnard, another endemic genus, more classically sericostomatid than the other four. *Barbarochthon* does not, however, belong to this family.

Although, seen in life, adults of both *Petrothrincus* and *Hydrosalpinx* somewhat resemble sericostomatids in appearance and posture they do not fit into the Sericostomatidae, primarily because the males have five-segmented maxillary palps similar to those of the females. Barnard (1934) contented himself with placing both under Aequipalpia, commenting that they might be included in the Molannidae-Beraeidae were it not for the presence of a discoidal cell in the fore wings. He also commented (p. 323) that "the genus [*Petrothrincus*] bears a general resemblance to *Thremma* in the venation of the female, and the scutiform larval case. There are several peculiarities, however, in the venation, including the dissimilarity in the sexes. The larval resemblances are evidently due to similarity of habitat, and do not necessarily indicate relationship." In that Barnard appears to be perfectly correct. The two families show such major differences that *Petrothrincus* cannot possibly be accommodated in the Uenoidae: Thremmatinae (in which *Thremma* is now placed). Lestage (1936) discussed their position in some detail, but left it open, suggesting (as mentioned above) that they be placed in a special division, a division more primitive than the Molannidae in its retention of the discoidal cell in the fore wings, and heralding the Beraeidae in larval type. Ulmer (1955) placed *Petrothrincus* in the Helicopsychidae with a query. Fischer (1964) put it into the Molannidae, leaving *Hydrosalpinx* as *incertae sedis*, quoting Scott (1967) as tentatively placing it in the Beraeidae. Fischer was under a misapprehension since in Scott's preliminary key the family Beraeidae was keyed out *per se*, followed by a note that *Hydrosalpinx* and *Petrothrincus* did not entirely agree with that family as diagnosed and had therefore been given separate positions in the key under their generic names. Marlier (1962) left both genera as *incertae sedis*, pending a world revision. When the present author originally started to construct keys to southern African Trichoptera, it was found convenient at both adult and larval levels to lump the five sericostomatid genera together with *Barbarochthon* in a heterogeneous group as "western Cape sericostomatids". *Hydrosalpinx* and *Petrothrincus* were keyed out separately as genera. More recently, however, when revising the keys to Afrotropical families, the author had occasion to study all the southern African genera in detail and with more experience, and tried again to fit *Barbarochthon*, *Hydrosalpinx* and *Petrothrincus* into those families from elsewhere that appeared to be nearest to them, but again without success. It would only be possible to do so by altering the family diagnoses to fit, not a very desirable or satisfactory procedure, particularly for endemic genera from another part of the world.

After much consideration and subsequent consultation with Dr F. Schmid, Professor G.B. Wiggins and Dr A. Neboiss, the author decided to erect three new families, the Hydrosalpingidae, Barbarochthonidae and Petrothrincidae, to accommodate them. This brings southern Africa more into line with the Australian Region where several new families have been erected to accommodate endemic genera which did not fit into existing families although they had previously been allocated to one or another of the older families despite the difficulties encountered in so doing.

The original intention had been to erect the three new families in the present paper. As it transpired, however, they were unintentionally, but validly, erected in the chapter on Trichoptera (Scott, 1985) for the book *Insects of Southern Africa* (Scholtz and Holm, 1985). This poses problems to research workers because the families were not formally erected nor do they appear under the author's name. The present paper, although long delayed by the author's illness, fills the lacunae, providing the necessary descriptions, illustrations and discussion. In addition cladistic analyses of the phylogenetic relationships of the twelve families considered to belong to the Sericostomatoidea are presented by

Dr F. C. de Moor.

A diagnosis is given for each of the proposed new families, all of which are monogeneric. In view of the fact that two of the three genera on which the families are based are also monotypic, namely *Hydrosalpinx* and *Barbarochthon*, it has been decided in those cases to omit a generic diagnosis as it is covered by the full description of the species. As Wiggins (1984) has pointed out, the diagnostic characters of a monotypic genus are not objectively separable from those of the species. In the third genus, *Petrothrincus*, there are three species, two known and one described in this paper, making a separate diagnosis for the genus possible. Comments on such biological aspects as are known for each genus are given.

Fully illustrated descriptions of the type-species of each of the three genera and therefore of the three families are given. These include descriptions of the male and female imagos, and the larva and pupa together with their cases. With respect to *Petrothrincus* differences between the type-species, the second known species and the new species are noted, the two latter are described briefly and illustrated, and a key to the species is provided. The possible origins of the three families are discussed.

In this paper southern Africa is regarded as being delimited to the North by the Cunene, Okavango and Zambezi rivers, including their watersheds but excluding Lake Malawi. The north-flowing rivers on the other side of the watershed are regarded as central African.

Geographical references are taken from 1:50 000 maps, each of which covers a quarter degree square. Each degree square is numbered and divided into 16 such maps (15' x 15' squares). As an example 3318 AB refers to a map between 33° to 33°15' S and 18° 15' to 18° 30' E (see Leistner and Morris 1976, introductory 4 pp.). Indication of localities in this way is necessary as older localities are often not precise and may refer to a range of mountains or a whole river.

Abbreviations and names of collectors cited in the text are as follows: ACH - A.C. Harrison; ADH - A.D. Harrison; BCW - B.C. Wilmot; DFH - D.F. Houck; FCdM - F.C. de Moor; FMC - F.M. Chutter; HB - H. Bertrand; HGW - H.G. Wood; HM - H. Malicky; HMB - H.M. Barber; JDA - J.D. Agnew; JMK - J.M. King; KHB - K.H. Barnard; KMFS - K.M.F. Scott; NK - N. Köhly; RD - R. Dick.

## THE THREE RECENTLY ERECTED FAMILIES

### Family Hydrosalpingidae Scott 1985

Hydrosalpingidae Scott 1985: 331, 337; Scott 1986: 231, 234 (table 1).

Type-genus *Hydrosalpinx* Barnard 1934: 321, 323.

The family Hydrosalpingidae was erected to receive the single genus *Hydrosalpinx* Barnard. One species of *Hydrosalpinx*, *H. sericea* Barnard, is known. It has been recorded from a number of mountain streams in the western and southwestern Cape Province.

### RECOGNITION

Imago medium-sized, hairy, golden-brown. Maxillary palps 5- segmented in male and female, very long in male. Labial palps 3- segmented, very long in male. Pronotum with 1 pair warts; mesonotum without warts, usually with a pair of single setae; scutellum with single large wart with lateral setae.

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

### FAMILY DIAGNOSIS

#### *Male imago*

Ocelli absent; eyes large, glabrous; vertex with pair of small inter-antennary setose warts and pair of large, subtriangular posterior setose warts, also with pair of small tubercles, one on each side of median sulcus. Antennae slightly longer than fore wings; scape stout, slightly shorter than head; flagellum tapered. Maxillary palps very long, 5-segmented, with fifth segment longest, not annulate. Labial palps long, 3-segmented, with third segment longest, not annulate.

Pronotum with single pair of large warts; mesonotum without warts; scutellum elongate with single large sub-oval wart bearing lateral setae. Tibial spurs 2, 2, 4; some tibial and tarsal segments with double row of small black spine-like setae and several similar setae at most tarsal apices. Fore wings with discoidal cell closed, thyridial cell very long, forks 1, 2, 3 present, fork 5 absent. Hind wings with discoidal cell open,  $R_2$  and  $R_3$  fused; fork 2 only present. Wing-coupling macrotrichia present along part of costal margin of hind wings, linking with inturned anal margin of fore wings.

Genitalia with branched paired claspers (inferior appendages) arising from ninth segment; paired preanal appendages arising from tenth segment which is long; aedeagus large, simple; parameres absent.

#### *Female imago*

Larger than male and with more complete wing venation, the discoidal cell being closed in both fore and hind wings, although in the latter the closure may be unclear. In the fore wings forks 1, 2, 3 and 5 are present, as  $Cu_1$  is forked. In the hind wings  $R_2$  and  $R_3$  are separate, so forks 1 and 2 are present;  $R_2$  is complete. Other characters as in male.

Genitalia with simple dorsal plate (presumably those of ninth and tenth segments fused). Sternites of tenth segment unsclerotized; pair of terminal appendages visible, very small.

#### *Larva*

Case-dweller; larva not flattened; head, pro- and mesonota strongly sclerotized; no prosternal horn. Head rounded; frontoclypeal apotome with one pair of indentations; antennae very small, at base of mandibles; eyes prominent, set fairly far forward; mouthparts small; ventral apotome a short triangle, not completely separating the genae, only clearly seen in juveniles. Metanotum membranous with single pair of small sclerites. Fore legs stout, middle and hind legs slender. First abdominal segment with flattened dorsal hump, lateral humps each with a small, oval, dorsally pubescent sclerite; abdominal segments smooth, lacking setae; lateral fringe absent; lateral tubercles present on eighth segment; gills absent; ninth segment with a dorsal sclerite. Anal prolegs very short, their bases fused to form an apparent tenth segment; anal claw with one or two dorsal hooks.

#### *Larval case*

A somewhat tapered, gold-coloured, silken tube with slightly flared opening and terminal membrane pierced by a circular aperture.

*Male pupa*

No male pupae were available to the present author, however, according to Barnard (1934) the male is similar to the female but smaller and has very long maxillary and labial palps as in the imago.

*Female pupa*

Antennae slightly longer than body; labrum semicircular with short median lobe; mandibles strong with pointed apex, inner margin strongly serrated; maxillary palps only reaching end of metanotum; labial palp shorter. Middle tarsi fringed for swimming. Lateral abdominal fringes present, conspicuous, with tufted ends; gills absent; wing sheaths reach beginning of seventh abdominal segment. First abdominal segment without lappets; second to sixth segments with pre-segmental dorsal plates; fifth segment with postsegmental dorsal plate; all dorsal plates small. Anal appendages slender, rod-like.

*Pupal case*

An altered larval case, closed anteriorly and just behind the pupa with new membranes, each with a slit, with old posterior membrane persisting, and attached anteriorly with a single dorsal holdfast.

**Genus *Hydrosalpinx* Barnard 1934**

*Hydrosalpinx* Barnard 1934: 321, 323, Figs 16a-o.

Type-species *H. sericea* Barnard 1934.

Etymology: Generic name feminine, meaning a water trumpet; specific name, referring to silk; both names being descriptive of the case.

As *Hydrosalpinx* is a monotypic genus a generic diagnosis is omitted. It is covered by the full description of the species.

***Hydrosalpinx sericea* Barnard**  
(Figs 1-32)

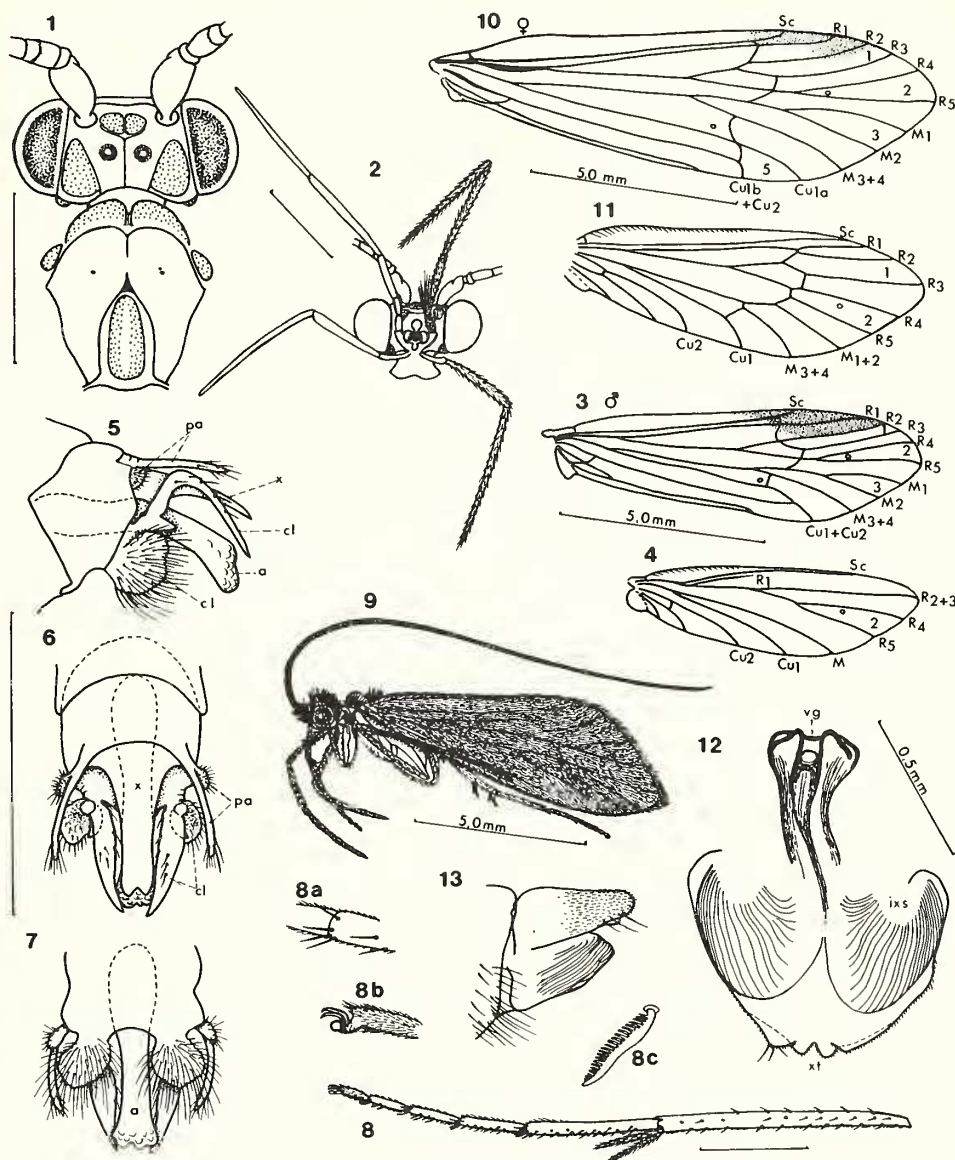
*Hydrosalpinx sericea* Barnard 1934: 321, 323, figs 16a-o (male, female, larval and pupal parts, pupal case); Scott 1985: 337, figs p (p. 331), v (p. 332); Scott 1986: 232, 236, 243.

Lectotype male here selected and designated from Barnard's syntypes, South African Museum, Cape Town.

Type locality: western Cape Province, Bain's Kloof, Wellington Mts, [3319 CA].

Barnard did not as a rule select types, the specimens in his collection being unmarked apart from name, locality, collector(s) and date. A Lectotype has been selected from those specimens listed in

SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES



Figs. 1-13. HYDROSALPINGIDAE : *Hydrosalpinx sericea* Barnard, male, female (Scale lines = 1 mm unless otherwise indicated).

Material used: KHB

1. male: Head, pro- and mesonota, dorsal. 2. male: face, showing maxillary and labial palps. 3, 4. male: fore and hind wings. 5, 6, 7. male genitalia, lateral, dorsal and ventral views (a - aedeagus, cl - clasper, ic/icl - internal branch of clasper, pa - preanal appendage, x - hood formed by tenth tergum). 8. male: left middle leg, tibia and tarsus, 8a, tarsal apex with crown of spinelike setae, 8b, fifth tarsal segment with claw, 8c, single plumose spinelike seta, all further enlarged. 9. male: entire insect, lateral. 10, 11. female: fore and hind wings. 12, 13. female: genitalia, ventral and lateral views (ixs - ninth sternite, ixt - ninth tergum, vg - vagina, xt - tenth tergum) (13 after Barnard 1934 fig. 16h).

his 1934 paper and still remaining in the South African Museum collection. It is the best available male (not perfect but nearly so, right fore leg and labial palp only being missing) and is from Bain's Kloof (14.iv.1933). The other specimens are regarded as Paralectotypes. The extant material and original records are listed after the descriptions of the different stages.

#### DESCRIPTION OF IMAGOS (Figs 1-13).

##### *Male imago* (Figs 1-9)

Medium-sized, hairy; fore wings 9-10 mm in length.

Colour description given by Barnard, probably from freshly pinned specimens - "Head and thorax fulvous with, pale golden hairs. Legs and antennae ochraceous or fulvous, the latter darker proximally. Wings thickly pubescent; fore-wings bright golden-brown, the costal area and the apical cells duller and darker brown, the veins paler and brighter; hind-wings greyish-brown, fringe grey."

Further description from male imagos, pinned and in spirit, from Barnard's collection.

Ocelli absent; eyes large, black, glabrous; vertex with a pair of small inter-antennary warts, a pair of large postero-lateral warts and a pair of bare median protuberances (Barnard's conical warts); mid-cranial sulcus complete (Fig. 1). All warts on head and thorax bear long, upstanding golden setae. Antennae longer than fore wings; scape stout, slightly shorter than head, with long setae; flagellum basally thick (less so than scape), tapering to slender tip. Maxillary palps (Fig. 2) laterally flattened, 5-segmented, very long (5.0 mm), with first and second segments very short, third about equal to first and second together, fourth more than double length of third, fifth a little longer, simple, with second segment bearing several long dorsal setae. Labial palps 3-segmented, long, with first segment short, second longer, third longest, simple (length 4.0 mm).

Pronotum with single pair of large warts; mesonotum without warts; scutellum elongate, subtriangular, with single large suboval wart bearing scattered setae. Legs with tibial spurs 2, 2, 4: fore and middle tibiae and tarsi and hind tarsi with double or treble row of black spinelike setae, and with a crown of three or four similar setae at tarsal apices on middle and hind legs (Figs 8 and 8a, b). These spinelike setae are plumose (Fig. 8c). Wings (Figs 3, 4, 10, 11) with venation differing in both wings in the two sexes. Male fore wings (Fig. 3) with discoidal cell closed, median cell open, thyridial cell very long; there are forks 1, 2, 3 and a large jugal lobe; M is 3-branched;  $Cu_2$  joins  $Cu_1$ ,  $A_1 + A_2$  join basally, meeting the hind margin at the arculus. Male hind wings (Fig. 4) with discoidal cell open; only basal part of  $R_1$  present,  $R_2$  and  $R_3$  fused, M and  $Cu_1$  unbranched, fork 2 only present and jugal lobe rounded and inturned. Corneous points present in both wings in fork 2 and in the thyridial cell in the fore wings. (Barnard gave the male fore wings forks as 1, 2, 3, (5), remarking that fork 5 was spurious owing to  $Cu_1$  not being forked; it appears preferable to omit it, as the area between  $Cu_1$  and  $M_{3+4}$  cannot be mistaken for a true fork 5.) The hind wings bear long macrotrichia (not hamuli) on the basal part of the costa, evidently linking with the inturned hind margin of the fore wings in flight. There is a long setal fringe along the anal margin of the hind wings.

The dorsum of the abdomen bears a pair of oval setose warts on each segment except the first.

Genitalia (Figs 5-7) with ninth and tenth tergites dorsally fused; paired preanal appendages arising from tenth segment near junction with ninth, long, slender, with blunt apices bearing a few setae, and small setose basal lobe. Tenth tergite forms a median dorsal apical hood with bifurcate apex, transparent and difficult to see. Claspers with lower branch broadly lobate, rounded and setose in lateral view, with upper branch sinuously blade-shaped, strongly curved dorsally, posteriorly and inwards with a stout triangular process near base and with a few setae. In the two pinned specimens

the upper branches cross over one another dorsally. Aedeagus stout, lacking parameres or endothecal processes.

*Female imago* (Figs 10-13)

Larger than the male (fore wings 11-12 mm). Palps similar but shorter (maxillary palps 3.0 mm, labial palps 1.5 mm in length); otherwise very similar apart from wing venation and genitalia, which are dealt with below.

Wing venation more complete than in male, the discoidal cell being closed in both fore and hind wings, although in the latter the closure may be unclear. In the fore wings forks 1, 2, 3 and 5 are present as  $Cu_1$  is forked. In the hind wings  $R_2$  and  $R_3$  are separate, so forks 1 and 2 are present;  $R_1$  is complete.

Genitalia (Figs 12, 13) with ninth and tenth tergites apparently fused, simple, rounded, partly pubescent, with a few longer lateral setae, apex slightly projecting, bilobed, without appendages; sternal plates of ninth segment unsclerotized or only slightly so, rounded, with numerous striae or corrugations, vagina strongly sclerotized; sternum of eighth segment thickly setose along posterior margin.

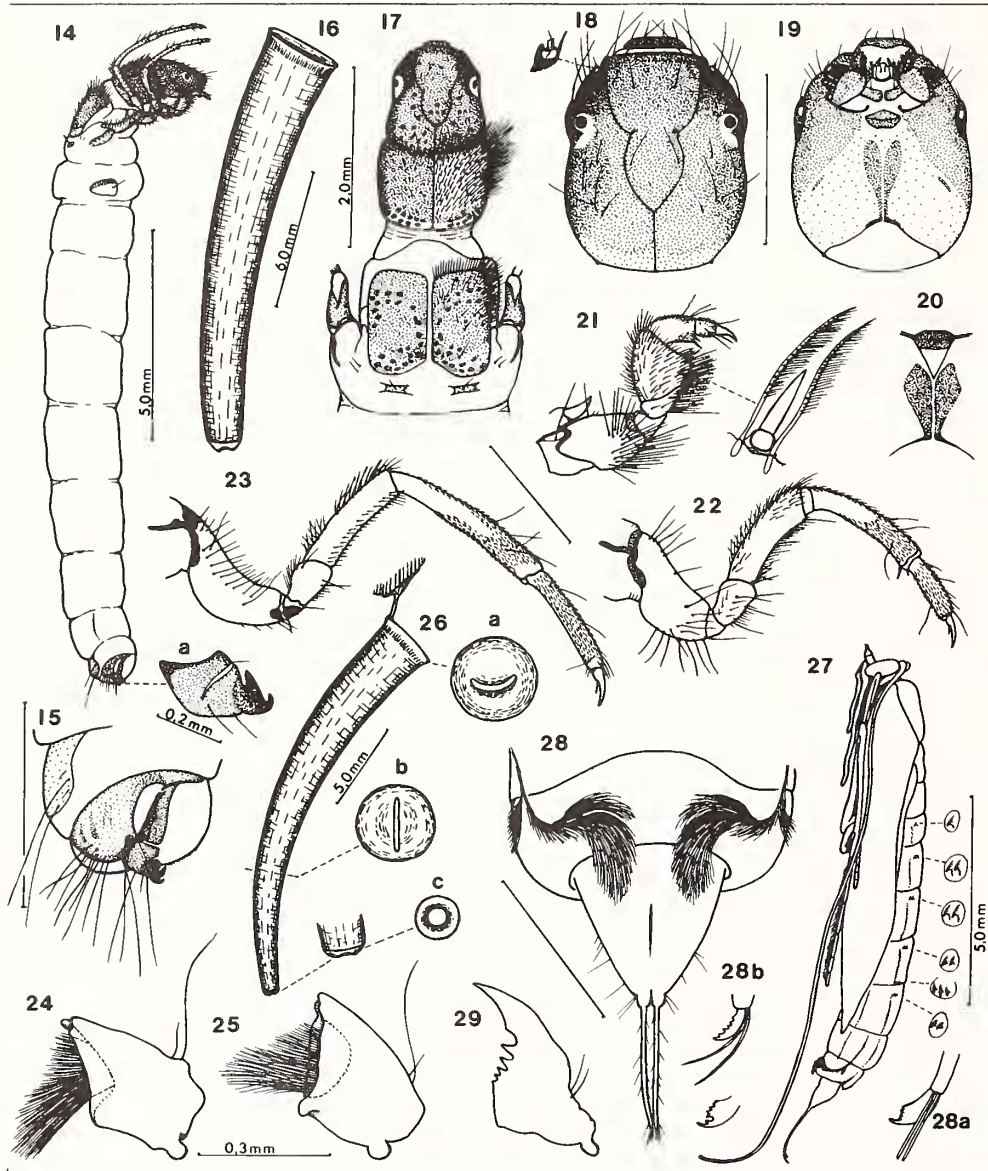
DESCRIPTION OF MATURE LARVA (Figs 14-25, 30-32).

The following description was made from material (MISC 306a) (in spirit) collected in 1976 from a mountain stream, tributary of the Vet River, Garcia's Pass, north of Riversdale in the southwestern Cape, which was compared with the earlier specimens from the western Cape and Barnard's own material, descriptions and drawings.

Case dweller; length 15-16 mm; larva not flattened.

Head (Figs 17-20, 31, 32) slightly longer than broad, very dark brown; cuticle strongly sclerotized, pitted; muscle spots smooth, shining, colour as head; genae paler; frontoclypeal apotome with single pair of lateral indentations; ventral apotome short, triangular, darker brown anteriorly, pale posteriorly, triangular shape only discernible in young larvae (Fig. 20); ventral ecdysial line unclear or absent; pair of brown pigmented areas present lateral to mid-line. Eyes prominent, situated fairly far forward, beneath a short, strong ridge, giving a faintly 'beetle-browed' effect, each eye in a clear area under cuticular lenses. Antennae inconspicuous, at bases of mandibles. Labrum small with rounded anterior margin, partially retractile. Labium with clear paired labial palps. Maxillary palps stout, 5-segmented, strongly setose; galeae also long, stout; stipites large. Mandibles (Figs 24 and 25) small, heavily sclerotized, hollowed on inner side with strong brushes, two small apical teeth and two setae on outer side of each.

Thorax (Figs 14, 17) with prosternal horn absent. Pronotum without carina or anterolateral expansions, mainly very dark brown and thickly set with long, fine setae, posterior part paler with dark spots and few setae. Pleural sclerites (Fig. 21) light brown; pre-episternum strong, curved, pointed, not fused with episternum. Mesonotum with large oblong paired plates, dark brown anteriorly, paler posteriorly, with dark spots; plates with many relatively long, fine, pale, inconspicuous setae, mainly anterolaterally. Metanotum membranous apart from a pair of very small, transversely oblong, lightly sclerotized plates, each with a single seta. Sternum membranous. Fore leg (Fig. 21) shortest, stout; coxa with long, mainly ventrally placed setae; trochanter divided, proximal part bare, distal part with ventral trochanteral brush; femur widely subtriangular, with many fine setae and long ventral



Figs. 14-29. HYDROSALPINGIDAE: *Hydrosalpinx sericea* Barnard, mature larva, pupa and cases

(Scale lines = 1 mm unless otherwise indicated).

Material used: larva MISC 306a; pupa KHB

14. Mature larva, habitus, lateral, a, anal claw, much enlarged. 15. Anal region, further enlarged. 16. Larval case. 17. Head and thoracic nota, dorsal view (setae shown only on right thoracic nota), muscle spots indicated. 18. Head, dorsal with antenna fur ther enlarged. 19. Head, ventral. 20. Ventral apotome of young larva. 21. Right foreleg, with plumose and bladlike setae further enlarged. 22, 23. Right middle and hind legs. 24. Right mandible, dorsal view. 25. Left mandible, ventral view. 26. Pupal case showing holdfast; a,b,c, membranes closing front aperture, end of part of case occupied by pupa and hind aperture respectively (after Barnard 1934 fig. 160). 27. Immature pupa, female, habitus, with dorsal plates further enlarged showing hooks. 28. Apex of abdomen; apices of anal rods (appendages) shown further enlarged, a. of specimen drawn, b. variations (after Barnard 1934 fig. 16m). 29. Left pupal mandible.

fringe, like that of trochanter including feathered setae and strong blade-like bristles; tibia with small distal ventral protuberance bearing two spinelike setae; tarsus smaller; claw stout, sharp, about same length as tarsus, with long basal seta. Middle leg (Fig. 22) longer, hind leg (Fig. 23) longest, similar in form, each with long, curved coxa, short divided trochanter (proximal part small, distal part apically widened, rounded); femur shorter than tibia, noticeably so in hind leg; tarsi and parts of tibiae finely pubescent in both; tarsal claw considerably shorter than tarsus with small basal seta part way along claw.

Abdomen (Figs 14, 15, 30) smooth, creamy white, with segmental divisions shallow, setae lacking or minute, no lateral fringe visible (feeble according to Barnard), gills absent; first segment with flattened dorsal protuberance and lateral protuberances, lateral humps each with an oval faintly sclerotized area bearing an anterior pubescent patch and a single seta; eighth segment with row of about 24 lateral tubercles on each side; ninth segment with very pale dorsal sclerite bearing two pairs of long posterolateral setae; apparent tenth segment (fused bases of paired anal prolegs) short, rounded, not produced into apical lobes or projections, with few setae; anal prolegs with large curved lateral sclerites almost meeting ventrally, bearing long apical setae, sclerotization variable with darker and paler areas. Ventral sole plates with dark dorsal margin; anal claws small, strong, with one or two stout, curved accessory hooks.

#### *Larval case* (Figs 16, 30)

Composed entirely of brighter or darker gold-coloured silk, tubular, widening anteriorly to the slightly flared aperture; posterior aperture circular, centrally placed on raised membranous base. Young larvae have a few sand grains incorporated near base of case; very early instars have a small sand-encrusted basal section; this section is evidently cut off later. Length of case (mature larvae) 17-18 mm.

Note on identification of larvae and cases of *Hydrosalpinx*: the golden, silken larval case is distinctive and easily recognizable. Care, however, must be taken to identify the larva itself, as empty cases are frequently utilized by larvae of *Athripsodes* species (Leptoceridae) which are usually found further down stream below the habitat of *Hydrosalpinx*. The antennae of the *Hydrosalpinx* larva are very small (Fig. 18) whereas those of *Athripsodes* are very long. Furthermore, the *Athripsodes* larva usually adds a collar of sand grains to the case.

#### DESCRIPTION OF PUPA (Figs 26-29).

The description of the pupa is based on the single available specimen, a damaged immature female, and on Barnard's description and drawings.

#### *Male and female pupae*

Antennae longer than body. Labrum semicircular with short median lobe. Maxillary and labial palps very long in male, somewhat shorter in female. Mandibles stout with broad base, strongly dentate inner margin and two dorsal setae (Fig. 29). Middle tarsi fringed for swimming. Lateral fringes present on seventh abdominal segment, curving round onto eighth, forming strong ventral tufts as indicated (Figs 27, 28). Gills absent. Presegmental dorsal plates on second to sixth abdominal segments (one hook per plate on second, two on third to sixth); postsegmental plates on fifth segment (three anteriorly directed hooks per plate). Anal appendages rod-like, slender, with scattered setae; dorsally

curved apices serrated with apical finger and two stout setae (Figs 28a, b).

*Pupal case* (Fig. 26)

An altered larval case, fastened to a rock or stone by a single anterodorsal attachment disc. Hind end closed by the larval membrane with a circular aperture. Posterior part of the case closed off from the section in which the pupa lies by a new membrane with a narrow vertical opening. Anterior end of case closed by a membrane with a transverse crescent-shaped slit on a central boss (Fig. 26c, b, a).

DISTRIBUTION

South Africa, mountain streams in the coastal ranges in the western and southwestern Cape Province.

MATERIAL EXAMINED

*South African Museum material*

Material in spirit

Lectotype: western Cape: Bain's Kloof, east side [3319 CA] (KHB, 14.iv.1933, male).

Paralectotypes: Western Cape: Bain's Kloof, east side [3319 CA] (KHB, 14.iv.1933, 5 males, one with head off and genitalia of two in microvials, 1 female abdomen lacking genitalia).

Other material: western Cape: Bain's Kloof, east side [3319 CA] (KHB, 14.iv.1933, an immature pupa); Bain's Kloof (larvae); Du Toit's Kloof [3319 CB] (CWT and HGW leg., 1.iv.1934, KHB det., 6 males, one lacking abdomen).

All the specimens are faded and most are more or less damaged.

Pinned material

Paralectotypes: Western Cape: Bain's Kloof (KHB, 1.v.1933, 2 males); Hottentots Holland Mts [3418 BB] (3000 ft. [= 914 m] KHB, March 1919, 1 female).

The males with wings spread are entire but the palps are much distorted, some curled up and some broken. The female, the only one still available, had had the wings spread but one pair and the abdomen had been removed and tipped onto card points by Barnard. The present author removed the fore wing (which was damaged) and the abdomen from the card points. She mounted the fore wing on a celluloid strip, removed, cleared and mounted the genitalia in Euparal on another celluloid strip and placed both on the pin with the specimen. The hind wing was found to be almost entirely missing.

*Albany Museum material*

Material in spirit

Western Cape: Great Berg River, Fransch Hoek [Franschhoek] Forest Reserve, Assegaibos stream tributary [3319 CC] (GBG 2k: ADH, 24.v.1950, larva), Assegaibos cold stream waterfall

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

(GBG 132c: ADH, 20.xi.1950, larva and GBG 752a: ADH, 26.xi.1953, larvae), source of Berg River at Sneeuwgat 3319 CC (GBG 372a: ADH, 28.ix.1951, larva); stream on Helderberg Mt., near Somerset West, [3418 BB] (MISC 157c: DFH, iv.1963, 4 larvae).

Southern Cape: Vet River, Garcia's Pass, north of Riversdale, tributary below Tolhuis [3421 AA] (MISC 306a: KMFS, 9.ii.1976, 23 larvae).

### MATERIAL CITED IN LITERATURE

Barnard (1934: 323): Hottentots Holland Mts [3418 BB] (KHB, 12 March 1919, 1 male, 1 female); Wolwenhoek Kloof, French Hoek [Franschhoek] [3319 CC] (KHB, April 1931, 1 male); Jonkershoek, Stellenbosch [3318 DD] (HGW, February and April 1931, male and female pupae); Bosch Kloof Keeromberg, Worcester [3319 DA] (KHB, January 1930, larvae); River Zonder End [Riviersonderend] Mts [3419 BA] (HGW, December 1931, larva); Cedar Mts [Cedarbergen], Clanwilliam [3219 AA] (KHB, January 1930, larvae); Du Toit's Kloof, Rawsonville [3319 CB] (KHB, March 1932, cases); Gt. Winterhoek Mts, Tulbagh [3319 CB] (KHB and HGW, November 1932, larvae); Bain's Kloof, Wellington Mts, [3319 CA] (KHB, 14th April 1933, males; KHB and HGW, 1st May 1933, males, females). All were deposited in the South African Museum, Cape Town. The extant material is listed above under material examined.

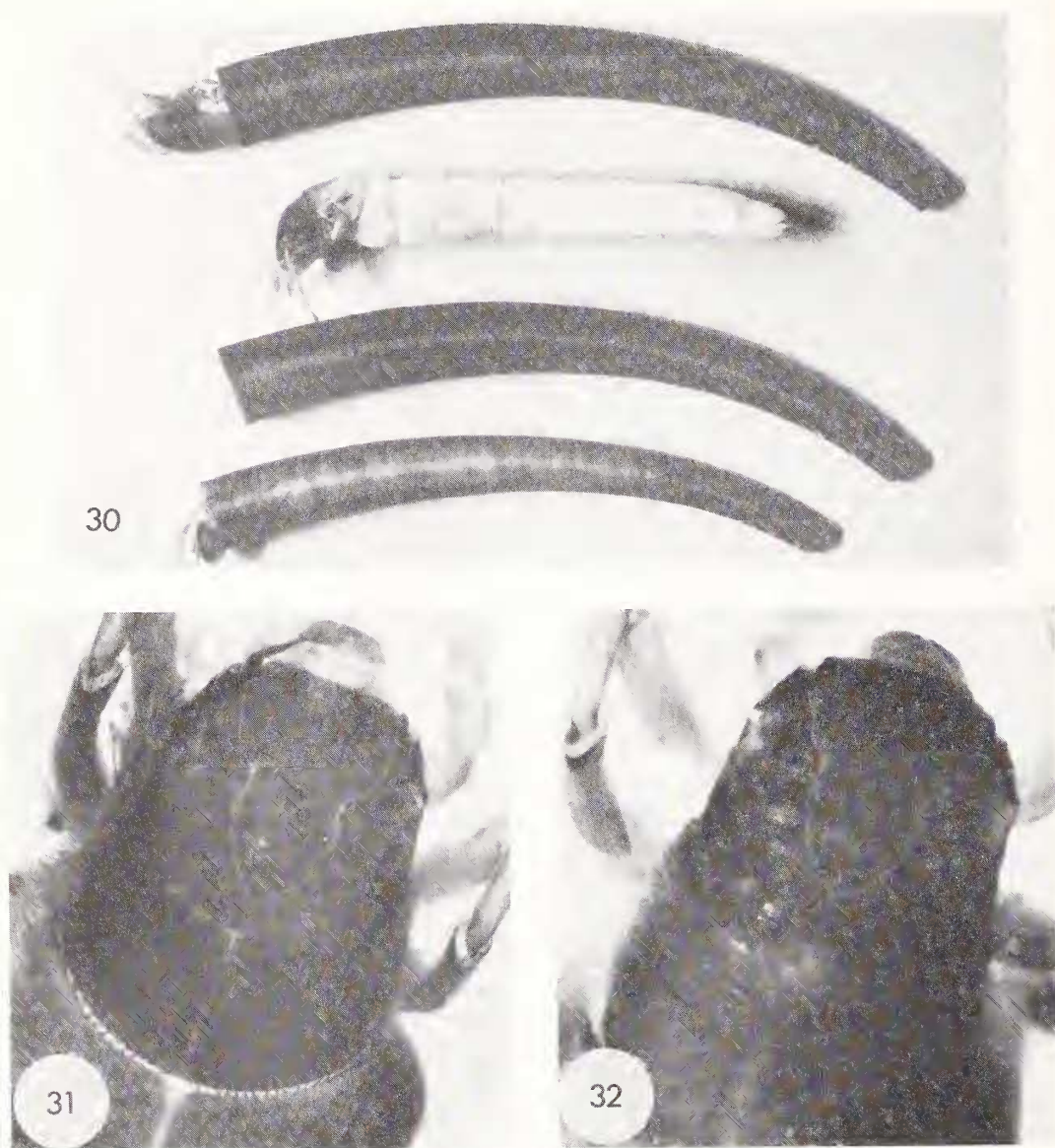
Jacquemart (1963: 347): Kogelbaai 10 miles south of the Strand, [western Cape] [3418 BD], shaded stream rushing down mountain slope, at road forming a waterfall, 19.xii.1950, larvae. The identity of these larvae is given by Jacquemart in his text as *Hydrosalpinx (sericea)*? and in the caption to his figure as *Hydrosalpinx sericea*. From a consideration of Jacquemart's drawings the present author concludes that they could be *Hydrosalpinx*, probably *sericea*. Unfortunately the cases were neither drawn nor described.

### BIOLOGY of the genus *Hydrosalpinx*

*Hydrosalpinx sericea* larvae inhabit high-lying, cold, acid montane streams in which they are found in waterfalls, stony runs and riffles. Common in Barnard's day, this species is now rarely found, though it may still be locally common in remote areas. Its disappearance from some of the recorded localities is more likely to be due to alteration of river beds by the building of reservoirs and constant bush fires than to pollution, as this does not occur in them. As Barnard was a great mountain climber many of his collecting places are inaccessible to collectors who are not mountaineers.

The adults, at rest and in flight, can easily be confused with sericostomatids such as *Rhoizema* spp. being little smaller than the smaller species of *Rhoizema* and having somewhat similar colouring. They have been collected in March, April and May.

The larvae may be seen grazing on the stones or rocks of the substratum. The gut contents and mouthparts, particularly the mandibles with their small, blunt apical teeth and stout inner brushes, indicate that the food comprises algae and detritus together with any animalcules and bacteria present.



Figs. 30-32. HYDROSALPINGIDAE: *Hydrosalpinx sericea* Barnard, mature larvae.

30. Photograph of 2 mature larvae in cases and one ex case. 31, 32. Photographs of head of mature larva further enlarged. Photographs by J.C. Hodges, Jr. (Ex. MISC 306a).

**Family Petrothrincidae Scott 1985**

Petrothrincidae Scott 1985: 331, 337-338; Scott 1986: 231, 234 (table 1).

Type-genus *Petrothrincus* Barnard 1934: 323, 325.

The family Petrothrincidae was erected to receive the single genus *Petrothrincus* Barnard. Three species of *Petrothrincus* are known. Two occur in high mountain streams in the western Cape Province, having been collected together by Barnard at 4 000ft [= 1 219 m] in the Hottentots Holland Mountains. The distribution of *circularis* Barnard, however, extends further downstream than that of *triangularis* Barnard. The third species was found in similar streams in the southern Cape Province. It has been described in this paper as *P. demoori*.

RECOGNITION

Imago small, dusky; fore wings may have light patches or appear plain grey. Maxillary palps 5-segmented in male and female. Pronotum with two pairs of warts; mesonotum with median patch of setae; scutellum with pair of anterolateral warts.

FAMILY DIAGNOSIS

*Male imago*

Ocelli absent; eyes large, glabrous; vertex with pair of small interantennary setose warts and pair of large posterior warts, without tubercles. Antennae stout, somewhat longer than fore wings; scape about as long as head; flagellum tapered. Maxillary palps 5-segmented, fifth not annulate. Labial palps 3-segmented, third simple, not annulate. Palps of normal length.

Pronotum with two pairs of warts; mesonotum without warts but with median field of recumbent setae; scutellum quadrangular with pair of anterolateral warts. Tibial spurs 2, 2, 4. No black spinelike setae on legs but colourless spinelike setae are present. Fore wings with discoidal cell closed, thyridial cell long, Cu<sub>1</sub> simple; forks 1, 2, 3 present, Cu<sub>2</sub> complete. Hind wings with costal area proximally broad, Sc and R<sub>1</sub> close together, sinuous, base of R<sub>2+3</sub> and discoidal cell absent, forming median discal area; M simple, joining Cu<sub>1</sub> about midway; only base of Cu<sub>2</sub> present. Wing coupling macrotrichia present on basal part of costa in hind wings.

Genitalia with ninth tergite narrow, fused to tenth, which is somewhat produced; preanal appendages prominent; paired spatulate claspers with internal branches arising from ninth; aedeagus accompanied by paired parameres; ninth sternite produced.

*Female imago*

Similar to male but slightly larger than male; antennae somewhat shorter. Fore wings similar to those of male, except for slight differences in base of anal veins. Hind wings also similar to those of male in regard to curvature of Sc and R<sub>1</sub> and broad basal costal area, however, base of R<sub>2+3</sub> is almost entirely absent; M is 2-branched; M and Cu<sub>1</sub> join basally; Cu<sub>2</sub> is complete, as are 1A and 2A.

Genitalia with tenth tergite with apical projection, partly covered by a lightly sclerotized dorsal hood; a bilobed supragenital plate and simple or paired vulvar scales flanked by lateral striations, probably

modified pleural folds but at least partly sclerotized; appendages absent. Vagina small, sclerotized.

#### *Larva*

Case dweller; dorsoventrally flattened, widest at metanotum; head, pro- and mesonotum lightly sclerotized; prosternal horn absent. Head round, frontoclypeal apotome with one pair of indentations; antennae small, at base of mandibles; eyes small, fairly far forward; mouthparts stout, prominent; ventral apotome sub-oval, completely separating genae. Metanotum membranous (or with very weak median plate). Legs fairly long, with sparse long setae. Abdomen smooth, deeply indented ventrally; first segment with very large dorsal hump, lateral humps lacking sclerotized areas or setae; lateral fringe and lateral tubercles absent; gills present, small, branched or simple, varying according to species. Anal prolegs longer than usual in eruciform larvae, not fused basally; anal claws small with comb of small teeth.

#### *Larval case*

Larval case of fine sand grains, more or less limpet-shaped, circular to suboval or triangular, with ventral plastron supporting larva, and with posterodorsal terminal aperture.

#### *Male pupa*

Antennae much longer than body; labrum semi-circular; mandibles strong, triangular, with apex blunt and inner margin feebly serrated; maxillary palps 5-jointed, palps reaching end of metathorax. Fore and middle tarsi fringed for swimming; lateral abdominal fringes and gills absent; wing sheaths reach end of seventh abdominal segment. First abdominal segment with small pair of posterolateral lappets; third to sixth segments with presegmental dorsal plates; fifth segment with post segmental dorsal plate; all dorsal plates small and weak. Anal appendages slender, the apical portion set with blade-like bristles. No special pocket for male genitalia.

#### *Female pupa*

Similar to male but slightly larger; antennae much shorter than body, curled round at seventh or eighth segment meeting ventrally.

#### *Pupal case*

An altered larval case, with a transparent ventral membrane sealing off the anterior end from the plastron forwards, and sealed down around the edges onto the substratum (rock or stone).

### **Genus *Petrothrincus* Barnard 1934**

*Petrothrincus* Barnard 1934: 323, 325-327, figs 17a-m, 18a-q.

Type-species *P. circularis* Barnard 1934, selected by Barnard, 1934.

Etymology: Generic name masculine, meaning coping-stones on a wall.

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

### GENERIC DIAGNOSIS

#### *Male imago*

Small in size, densely hairy, with long fringe on posterior margin of hind wings.

Ocelli absent; eyes large, glabrous; vertex with pair of small inter-antennary warts and pair of larger rounded posterolateral warts; mid-cranial sulcus complete. Antennae stout, considerably longer than fore wings; scape stout, nearly length of head; flagellum tapered. Maxillary palps of medium length, 5-segmented, strongly pubescent, carried upwards over face. Labial palps 3-segmented, pubescent. In neither maxillary nor labial palps is the last segment annulate.

Pronotum with two pairs of warts, median pair long, outer pair very small; mesonotum without warts but with median area bearing short recumbent setae; scutellum quadrangular with large well defined pair of anterolateral warts. Legs with tibial spurs 2, 2, 4; middle and hind tibiae with a few colourless spine-like setae. Fore wings with discoidal cell closed, median cell open, thyridial cell long; Sc and  $R_1$  running parallel, meeting costa separately; forks 1, 2, 3 present;  $Cu_1$  and  $Cu_2$  meeting margin separately; 1A and 2A joining before meeting margin; jugal lobe, small inturned. Hind wings with a basally wide costal area due to sinuous course of parallel Sc and  $R_1$ ; discoidal cell absent, discal area vein-free due to absence of base of  $R_{2+3}$ ; M unbranched, stem fused with M- $Cu_1$  cross-vein;  $Cu_2$  reduced.

Genitalia with tenth tergum fused with ninth, forming a blunt median process; preanal appendages long, prominent; aedeagus simple with a pair of strong spines (parameres: Barnard's titillators) lying just above it; clasper stout, spatulate, with subapical indentation, long internal branch and small uncinat spine (Barnard's uncinat titillator); ninth sternum produced.

#### *Female imago*

Like male but antennae shorter than body and more slender.

Fore wings with slight differences in bases of anal veins. Hind wings differ in that M is 2-branched, stem present, normal, as is  $Cu_2$  which reaches wing margin.

Genitalia with terminal tergum with apical projection; supragenital plate and vulvar scale(s) present (hard to distinguish); sternites obliquely corrugated; no appendages.

#### *Larva, pupa and their cases*

See under family diagnosis and under individual species.

### DISTRIBUTION

South Africa, Cape Province.

***Petrothrincus circularis* Barnard**

(Figs 33-63)

*Petrothrincus circularis* Barnard 1934: 325, figs 17a-m, 18a-f, r, (male, female, larval and pupal parts, larval case); Scott 1985: 331, fig. q.; Scott 1986: 236; Harrison and Elsworth 1958: 181, table 16, as Molannidae; Harrison 1958a: 260, as Molannidae; Harrison 1958b: 311, table 65.

Lectotype male here selected and designated from Barnard's syntypes, South African Museum, Cape Town.

Type locality: western Cape Province, Table Mountain, Echo Valley, Cape Town, [3318 CD] (named by Barnard as the Type locality, being the only place at which imagos were found.)

In regard to his choice of *P. circularis* as the type-species rather than *P. triangularis* (Hagen), Barnard (1934: 325) comments as follows: "Although by rights *triangularis* Hagen should be made the genotype, I have no adults from the type locality (Swellendam), and the true *triangularis* may possibly, though not probably, prove to be different from the Great Winterhoek specimens which I am describing as Hagen's species. In that case the Great Winterhoek specimens would require a new name. I therefore make *circularis* the genotype". Hagen described his species from larval cases only (Hagen 1864: 225), as *Molanna triangularis*.

Barnard treated his specimens of *circularis* as syntypes. Many are missing. From those that remain the best available male has been selected and marked Lectotype by the present author. This specimen is in spirit. It is the only male with complete antennae and has all other parts present except for one hind leg. The other extant specimens mentioned in Barnard's paper are regarded as Paralectotypes. All specimens are faded and damaged. The extant material and original records are listed after the descriptions of the different stages of *circularis*.

DESCRIPTION OF IMAGOS (Figs 33-46).

Description of male, female imagos as in generic diagnosis, with the following additional notes made from the imagos, pinned and in spirit, from Barnard's collection, material in the Albany Museum collection, and checked against fresh material received from Dr H. Malicky in 1988 (MISC 311e-j), from which Figs 41, 42 and 45 were drawn. New material (in spirit) appears dusky grey.

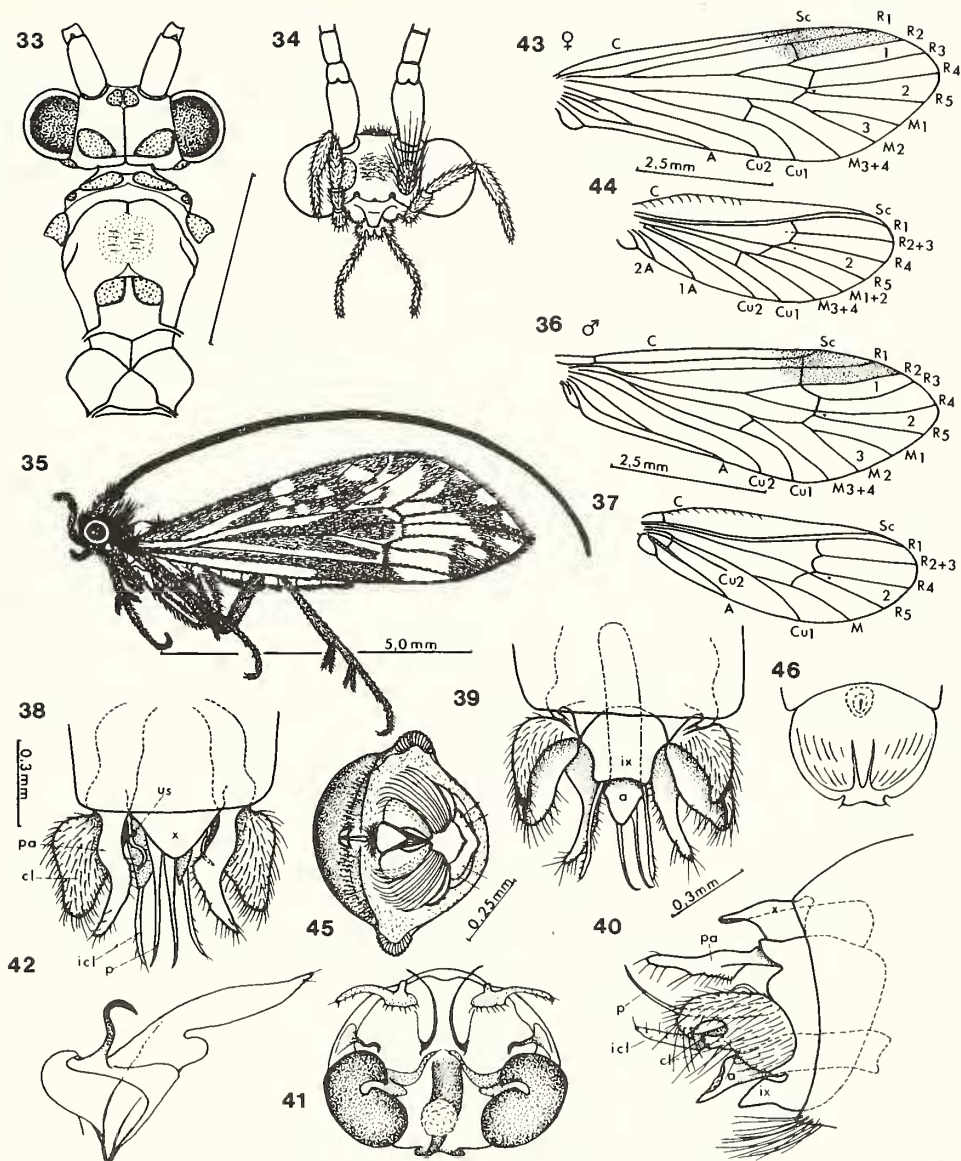
*Male imago* (Figs 33-42)

Small, fore wings 4.8-6.5 mm in length.

Colour, probably of fresh material, described by Barnard (1934: 325) as follows: "Head and thorax fuscous with silvery-white hairs. Legs and palps grey. Antennae dark brown. Wings grey-brown, fore-wing with silvery-white hairs in patches ..... [as indicated in Fig. 35]. Abdomen orange-fulvous, the tergites and sternites darker brown." In old pinned specimens the wings appear faded golden brown mottled with pale silvery patches.

Ocelli absent; eyes large, glabrous; vertex with warts all bearing very long setae; mid-cranial sulcus complete; face with a pair of lateral warts bearing long setae and paired mesal patches of short white setae. Antennae stout about a third longer than fore wings; scape stout with long setae, nearly length of head; flagellum finely pubescent, tapered. Maxillary palps (Fig. 34) of median length,

SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES



Figs. 33-46. PETROTHRINCIDAE: *Petrothrincus circularis* Barnard, male, female (Scale lines = 1 mm unless otherwise indicated).

Material used: KHB (Echo Valley), MISC 311h (Female)

33, male: head and thoracic nota, dorsal. 34, male face, showing maxillary and labial palps. 35, male: entire insect, brownish setae indicated, spaces on wings filled with white setae. 36, 37, male: fore and hind wings. 38, 39, 40, 41, male: genitalia, dorsal, ventral and lateral views, stylized sketch of caudal view showing relative positions of parts (a - aedeagus, cl - clasper, ic/icl - internal branch of clasper, p - paramere, pa - preanal appendage, us - uncinate spine, x - hood formed by tenth tergum). 42, male: inner process of clasper and uncinate spine drawn under compound microscope x 400. 43, 44, female: fore and hind wings (after Barnard 1934, fig. 17a). 45, female: genitalia, end view from new material. 46, female, ventral view (after Barnard 1934, fig. 18f, probably actually a caudal view - dorsal and ventral views do not show vulvar scale etc.).

densely pubescent, 5-segmented, carried upwards over face; two basal segments short, rest subequal but third longest and fifth shortest, simple. Labial palps (Fig. 34) 3-segmented, with segments subequal; third segment simple, finely pubescent.

Pronotum narrow, with median pair of warts long, lateral pair small, round, hard to see unless long setae are still present (they are easily lost); mesonotum with a quadrate median area bearing recumbent white setae; scutellum with warts bearing long setae. Legs hairy; middle and hind tibiae with a few colourless spinelike setae, no black ones. Wings (Figs 35-37) with venation as in generic description and as illustrated in the figures.

Genitalia (Figs 38-42) with terminal tergum triangular; preanal appendages large, curved, with median expansion, distally curved outward and upward; aedeagus simple with narrow apex and subapical membranous area with a pair of long parameres arising just above it; paired strongly spatulate claspers each with a long inner branch with basal expansion and small simple uncinat spine (Figs 41 and 42); apex of clasper bifid; ninth sternum apically truncate, slightly indented.

#### *Female imago* (Figs 43-46)

Similar to male in coloration and general appearance but slightly larger, fore wings 5.4-7.5 mm long.

Antennae shorter than in male, slender.

Fore wings practically identical to those of male except for basal parts of anal veins; hind wings show considerable differences. Hind wings with M two-branched, joins  $Cu_1$  at base,  $Cu_1$  simple,  $Cu_2$  complete, anals separate (Fig. 44 compare with Fig. 37). Hind wings have a large patch of blackish hairs on the lower surface; these tend to stick to the egg mass when laid.

Genitalia (Figs 45, 46) having terminal terga (ninth + tenth) with dorsal projection the shape of which depends entirely on angle of viewing; as in Fig. 45, 46 or 72 (of *triangularis*). Sternites membranous, showing lightly sclerotized ridges resembling pleural folds; single median vulvar scale, presumably covering vulvar opening, lateral to which the supragenital plates can be seen. Vagina clearly visible.

No good adult female of Barnard's material was available for comparison with his drawings, of which his Fig. 18 f. has been reproduced here as Fig. 46. There is, however, a good female pupa, which coincides well with them. The genitalia of one of the two females collected by Dr Malicky have been cleared and drawn (Fig. 45) for comparison with those of *P. triangularis* (Figs 68, 72). See also the SEMs of *P. demoori* female genitalia, which help considerably in elucidation (Figs 82-85).

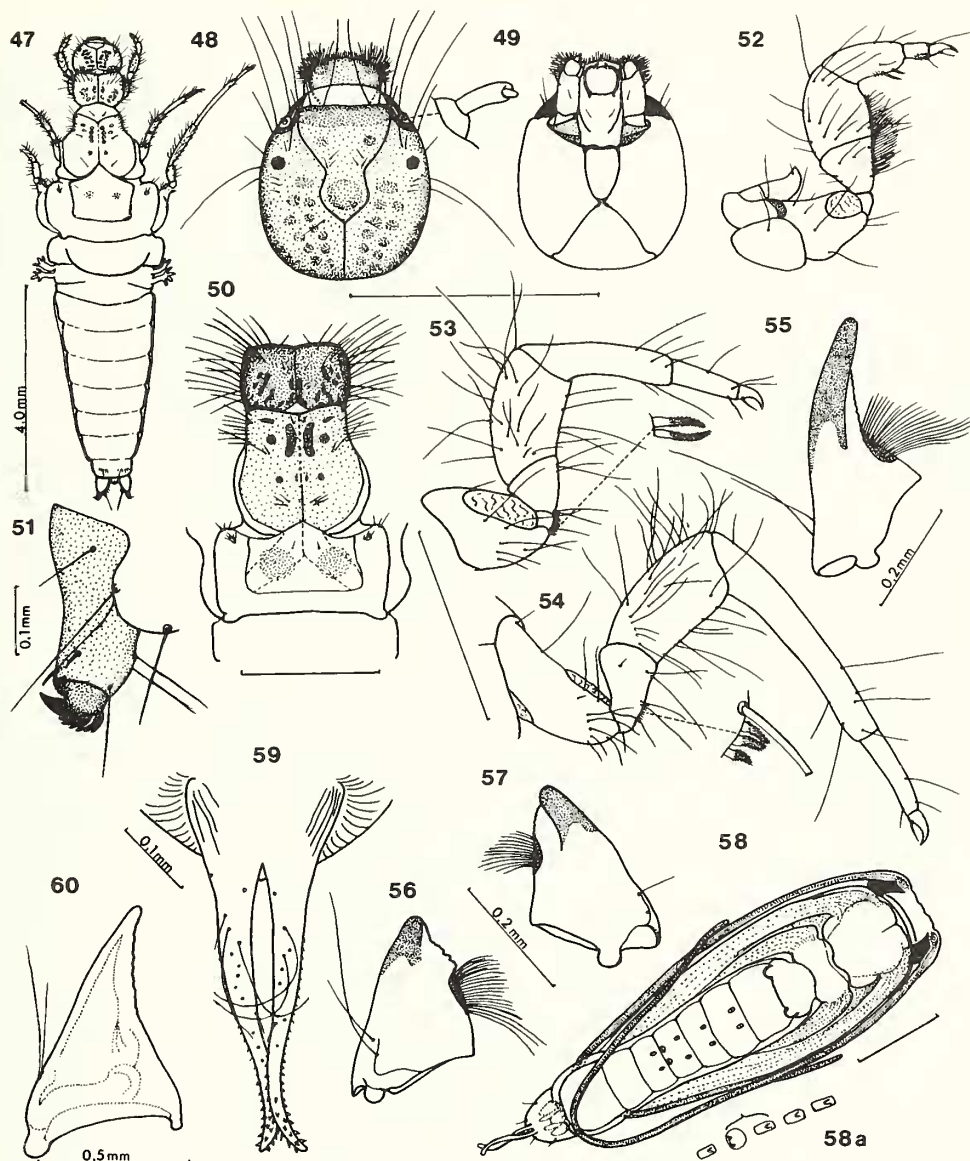
#### DESCRIPTION OF MATURE LARVA (Figs 47-57 and 61-63).

The following description and drawings were made from Barnard's own specimens and the more recently collected larvae in the Albany Museum (all material in spirit). Comparisons were made with Barnard's text.

Case dweller; up to 7 mm in length; dorsoventrally flattened; head, thoracic nota and legs light brown to yellowish or pallid in colour, with patterning of brown spots or marks, often faint; abdomen white.

Head (Figs 47-49, 62, 63) hypognathous, rounded; frontoclypeal apotome with single pair of lateral indentations; ventral apotome suboval, completely separating the genae. Eyes situated well forward, each under four cuticular lenses. Antennae small, near mandibular bases. Labrum small,

SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES



Figs. 47-60. PETROTHRINCIDAE: *Petrothrincus circularis* Barnard: 47-57. mature larva; 58-60. male pupa.

(Scale lines = 1 mm unless otherwise indicated).

Material used: MISC 291a (Figs 47-57); KHB (Figs 58-60).

47. Habitus of mature larva, dorsal. 48, 49. Head, dorsal and ventral, antenna much enlarged. 50. Thoracic nota, dorsal. 51. Left anal proleg, outer view. 52, 53, 54. Right fore, middle and hind legs, fore leg with pleural sclerites, middle and hind legs with trochanteral setulae further enlarged. 55. Right mandible of newly ecdysed larva, ventral. 56, 57. Right and left mandibles of older larva, ventral. 58. Habitus, dorsal, dorsal plates further enlarged. 59. Anal appendages, ventral, further enlarged. 60. Left mandible, dorsal.

rounded, prominent, with very small, paired indentations. Anteclypeus large, colourless. Labium thick with very small pair of palps. Maxillary palps apically small with large stout bases. Both mandibles with inner brush, in recently ecdysed mature larvae long, with slightly serrated ventral and apical cutting edges and with dorsal edge heavily sclerotized, plain; in older larvae the apical third may be worn away (compare Fig. 55 with Fig. 56), presumably due to grazing on the rock surfaces on which they live.

Thorax (Figs 47, 50) with prosternal horn absent. Pronotum sclerotized, without carina or anterolateral expansions; median suture present, sometimes faint or partial; pattern of muscle spots, often inconspicuous. Mesonotum with a pair of large pale yellow sclerites which may show brownish spots indicating Barnard's "three to four pairs of small chitinous plates medianly"; the median spots tend to run together forming paired median stripes; mesonotal plates shiny and lightly pitted; median ecdysial line faint or partial. Metanotum very broad, widest segment, with small paired posterolateral lobes of unknown function, with possible quadrangular median sclerite, hard to distinguish, shining and lightly pitted, colourless, with pair of vague brownish spots, segment otherwise membranous (this possible sclerite is not usually visible apart from the spots), with paired raised diagonal strips (Fig. 50) apparently overlying paired muscles. Sternum membranous with minute paired ventrolateral extensions of pronotum. Pleural sclerites largely colourless; pre-episternum long, sclerotized, with upturned tip, wide in lateral view, narrow in dorsal view (Fig. 52). Fore legs (Fig. 52) short, stout, with few long setae except on trochanter and femur which have a ventral fringe of long, simple setae; middle legs (Fig. 53) longer; hind legs (Fig. 54) longest; both middle and hind legs slender in dorsal view, wide in lateral view, with long setae but no ventral brushes; middle and hind trochanters with minute setulose marginal spines. Fore claw as long as tarsus, middle and hind claws little longer than fore claw, each with a single seta part way along claw.

Abdomen (Figs 47, 51) with lateral line fringe and lateral tubercles absent; a very narrow lateral fold along each side; segments not indented dorsally though deeply so ventrally (presumably to increase the respiratory surface); several segments with small, stout gills; first segment very broad, with wide flattened dorsal hump and large lateral humps; second segment with three pairs gills of which dorsolateral gills simple or bifid, lateral and ventrolateral ones 3-4 branched; third to fifth segments with a single ventral pair of branched gills; sixth segment with a simple pair; anal prolegs with colourless lateral sclerites and longer than is usual in eruciform larvae, fused only partially, not really forming an apparent tenth segment; anal claws very small with neat dorsal comb of teeth (Fig. 51).

#### *Larval case* (Fig. 61)

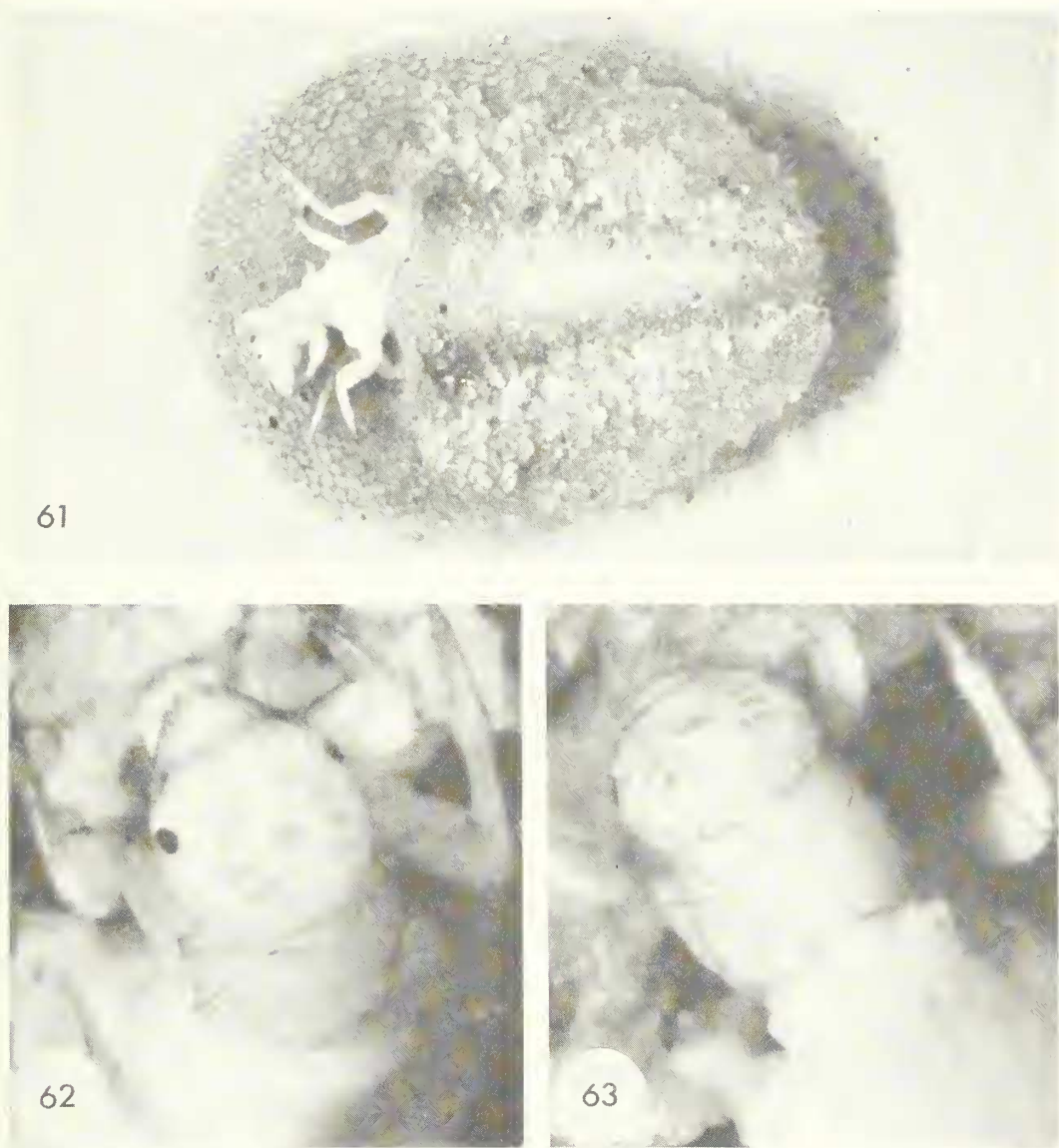
Limpet-shaped, subcircular, of minute sand grains cemented and lined with silk secretion, with ventral shelf (plastron) of sand grains supporting the larva, the spaces lateral to this being filled in with sand grains loosely held together by secretion, with a small oval posterodorsal aperture. The species name is derived from the subcircular larval case.

#### DESCRIPTION OF PUPA (Figs 58-60).

##### *Male pupa*

Antennae much longer than body, at least one and a half times body length, curled round as shown in Fig. 58. Labrum semicircular. Mandibles strong, triangular, with the apex blunt and with

SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES



Figs. 61-63. PETROTHRINCIDAE: *Petrothrincus circularis* Barnard, mature larvae.

61. Photograph of mature larva in case, ventral. 62. Photograph of head of larva, frontal view, further enlarged. 63. Photograph of head and thorax of larva, dorsal, further enlarged. Photographs by J.C. Hodges, Jr. (Ex MISC 291a).

inner margin feebly serrated. Fore and middle tarsi fringed for swimming. Lateral fringe and gills absent. Wing sheaths reaching end of segment 7. Segment 1 with a small pair of posterolateral lappets; segments 3-6 with small presegmental dorsal plates each with one tooth and segment 5 with in addition postsegmental dorsal plates each with two teeth (Figs 58, 58a). Anal appendages slender, slightly wrinkled, with a few long setae and many small blade-like bristles, particularly apically. No special pocket for male genitalia.

#### *Female pupa*

Similar to male but tends to be larger; antennae shorter, ends curled, meeting ventrally about segment 7 or 8.

#### *Pupal case*

The larval case is utilized, being sealed down onto a rock or stone round the margin. The larva spins a transparent ventral membrane sealing off the front end anterior to the plastron. Emergence is through a semicircular anterodorsal aperture in the case, cut by the pupal mandibles at eclosion.

#### DISTRIBUTION

South Africa, high mountain streams in the coastal ranges in the Cape Province, mainly in the western Cape, but also in the southern Cape. There is also a single isolated record from the vicinity of Rhodes in the Witteberg Mountains, southern outliers of the Drakensberg, eastern Cape Province (Jacquemart 1963), but this may prove not to be of *P. circularis*, as only larvae were collected, and the larval cases are very similar to those of *P. demoori*.

#### MATERIAL EXAMINED

##### *South African Museum material*

##### Pinned material

Paralectotypes: Echo Valley, Table Mountain, Cape Town [3318 CD] [2 990 ft = 911 m] (KHB, February-April 1933, 5 males in fair condition, one lacks two wings, one lacks one wing and abdomen, antennae are broken or missing and most palps are damaged or lacking, 9 females in fairly good to very poor condition, two lack genitalia).

##### Material in spirit

Lectotype: Echo Valley, Table Mountain, Cape Town [3318 CD] [2 990 ft = 911 m] (KHB, February-April 1933, male).

Paralectotypes: Echo Valley, Table Mountain, Cape Town [3318 CD] [2 990 ft = 911 m] (KHB, February-April 1933, 7 males in good to poor condition, bits of others and a cleared male abdomen, a single female body with thorax, legs and genitalia, the latter badly damaged).

Other material: Echo Valley, Table Mountain, Cape Town [3318 CD] [2 990 ft = 911 m] (KHB, February-April 1933, 3 immature pupae and larval and pupal exuviae); Hottentots Holland Mountains, [3418 BB] 4 000ft [= 1 219 m] East side (KHB, January 1933, larvae and pupae in cases).

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

### *Albany Museum material*

#### Material in spirit

Western Cape Province: Great Berg River, French Hoek [Franschhoek] Forest Reserve, main stream [3319 CC] (MISC 288: KMFS, 30.i.76, larvae); Assegaibos tributary [3319 CC] (GBG 131b: ADH, 30.x.1950, larvae); same place (MISC 289: KMFS, 30.i.76, larvae). Riviersonderend, French Hoek [Franschhoek] Pass [3319 CC] (MISC 290: KMFS, i and ii.1976, larvae); Witte River, Wolwekloof tributary [3319 CA] (MISC 291: KMFS, i and ii.1976, larvae); Breede River, Elandspad tributary [3319 CA] (MISC 292: KMFS, i and ii.1976, larvae); Witte River, Bastiaanskloof tributary [3319 CA] (MISC 295c: KMFS, i and ii.1976, larvae); Langrivier, main stream (MISC 297a: KMFS, i and ii.1976, larvae) and Assegaibos stream (MISC 298d: KMFS, i and ii.1976, larvae), both tributaries of the Eersterivier [3318 DD]); Witte River, Happy Valley [3319 CA] (MISC 304a: KMFS, i and ii.1976, larvae); Langrivier [3318 DD] (JMK, iii.75, larvae and pupa, vi.83, larva, x.83, 2 larvae, xi.83, 2 larvae); small feeder streams of the Dutoitsrivier in the Mount Rochelle Nature Reserve, Franschhoek Pass [3319 CC], at 900-1 000 m altitude (MISC 311 e-g, and h and j, HM, 20.iii.88, 3 male imagos and 2 female imagos, at light).

#### MATERIAL CITED IN LITERATURE

Barnard 1934: 325. Type locality: Table Mt. Cape Town [3318 CD] (KHB February - April, males, females). Groot Drakenstein (ACH); Jonkershoek, Stellenbosch [3318 DD] (KHB and HGW); Witte River, Wellington Mts [3319 CA] (KHB, November 1922); River Zonder End Mts [3319 AB] (HGW); Palmiet River [3418 BD] (HGW); Hottentots Holland Mts [3418 BB] (KHB); Great Winterhoek Mts (KHB and HGW); French Hoek [Franschhoek] Mts [3319 CC] (KHB and HGW); Elands Kloof, Citrusdal [3219 CA] (HGW).

These localities are all in the western Cape coastal folded belt. Contrary to his usual custom, Barnard did not give dates under each entry; these do appear on the labels with the specimens, but where specimens are missing there is now no possibility of dating them. The extant material is listed above under material examined.

All the records, apart from the Table Mountain and Hottentots Holland specimens were evidently of larvae only. The Hottentots Holland material also included many pupae, unfortunately immature.

Jacquemart (1963): western Cape Province: near Hermanus [3419 AC], twin waterfalls on Maanschijnkop (21.xii.1950, larvae); at Hermanus [3419 AC], stream (22.xii.1950, larvae); near Grabouw [3419 AA], Viljoenspas (11.ii.1951, larvae). Eastern Cape Province: 5 miles E.N.E. Rhodes [3027 DC], (on Witteberg Mountain, an outlier of southern Drakensberg Mountains), high mountain stream (10.iii.1951, larvae). The larvae from the eastern Cape may prove not to be of *circularis*, when male imagos are available. A recent search of the area by Dr F.C. de Moor and Miss H.M. Barber failed to discover any, but a further search will be made, as it is important to know if it is indeed *circularis* or *demoori* or another species.

***Petrothrincus triangularis* (Hagen)**  
(Figs 64-73)

*Molanna triangularis* Hagen 1864: 225 (larval case only).

*Petrothrincus triangularis* (Hagen), Barnard 1934: 325, 327, figs 18g-q (male, female, case); Barnard 1940: 643 (cases); Harrison 1958a: 260.

Neotype male here selected and designated from Malicky's specimens, Albany Museum, Grahamstown.

Type locality: Swellendam, western Cape Province [3420 BB].

Neotype locality: Dutoitsrivier in Mount Rochelle Nature Reserve, Franschhoek Pass, western Cape.

The name, *Molanna triangularis* Hagen 1869, was validly published in spite of the fact that the only material available to Hagen was an empty larval case because to satisfy the provisions of the International Code of Zoological Nomenclature (1985) a name published before 1931 need only be based on an "indication", in this instance "the description of the work of an extant animal" (Criteria of Availability, Article 12). The Type specimen, an empty larval case, is presumed lost.

As Hagen had no imagos Barnard described them from his own material but, as was his wont, did not designate a type. Barnard's extant material and original records are listed after the descriptions of the different stages. The extant male lacks its genitalia and so cannot be named a Neotype. Two males and two females were received recently from Dr H. Malicky. These were collected at light, together with *circularis* imagos, from small feeder streams of the Dutoitsrivier in the Mount Rochelle Nature Reserve, Franschhoek Pass, western Cape [3319 CC], at 900-1 000 m altitude. The best male (MISC 311a) is here designated the Neotype. It is lodged in the Albany Museum.

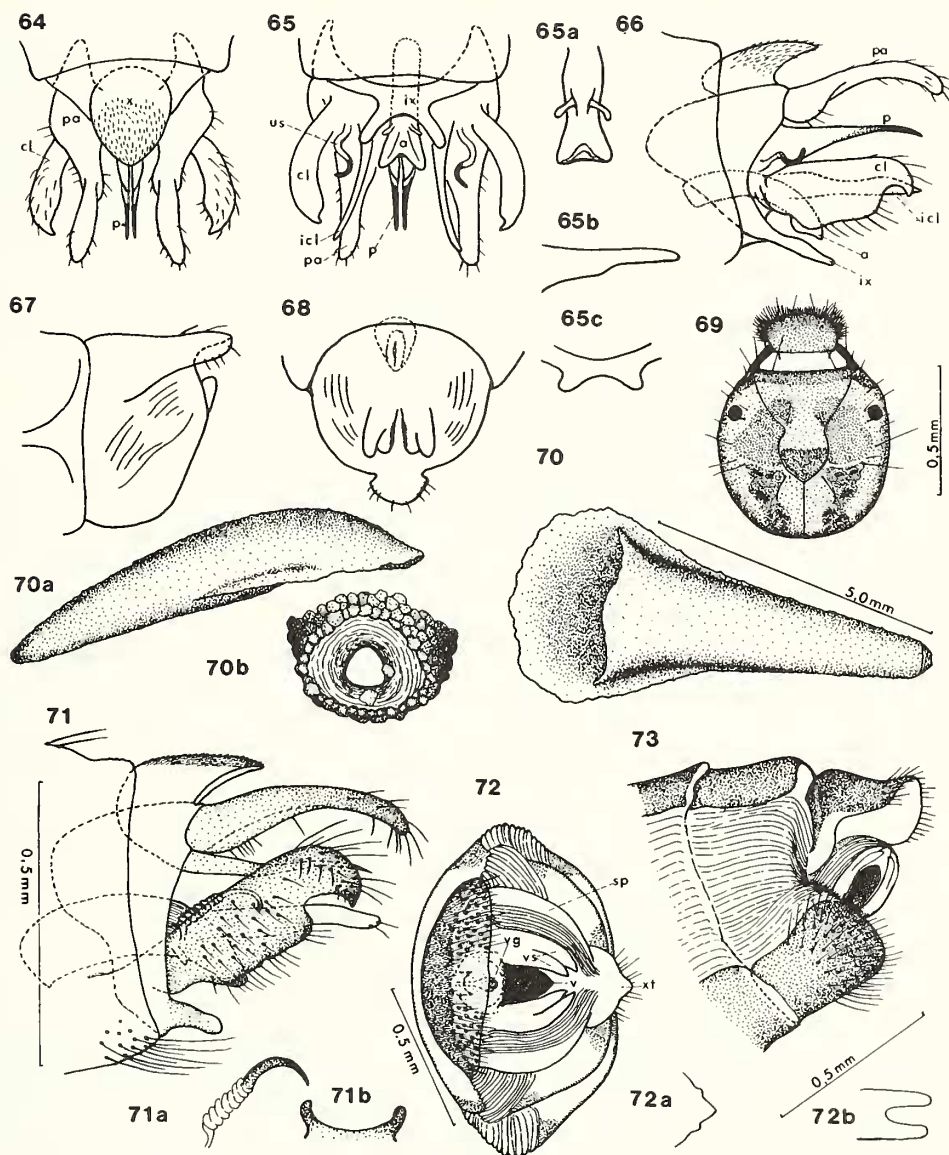
DESCRIPTION OF IMAGOS

*Imagos* (Figs 64-68, 71-73)

According to Barnard (1934) the coloration of the imagos and the wing venation are as in *circularis*, excepting that the fore wings appear to have more patches of silvery white setae, and the setal fringes are very long, particularly on the anal margin of the hind wings. (Setae fringing wings in *circularis* may be equally long but may have been lost or abraded in the extant material.) The recent light trap specimens have, unfortunately, lost most of their setae, including wing fringes. The length of the male fore wings is 5.5-6.8 mm and that of the female is 6.0-7.9 mm. The descriptions are based on Barnard's descriptions and drawings and remaining female imagos and upon the material collected by Malicky. There are very minor differences in wing venation between *triangularis* and *circularis*, not sufficient to affect the generic diagnosis or even to differentiate between the species in the absence of genitalia.

The male genitalia (Figs 64-66, 71) are compared with those of *circularis* (Figs 38 - 42). They have the ninth tergum ovate not triangular; preanal appendages longer and wider, curved in lateral view, lacking the median expansion, but with a small basal expansion; aedeagus with apex indented, and two small sclerotized ventral processes (Fig. 65a), the parameres are shorter and stouter with

SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES



Figs. 64-73. PETROTHRINCIDAE: *Petrothrincus triangularis* (Hagen), male, female, larva (Scale lines = 1 mm unless otherwise indicated).

Material used: MISC 311b (male), MISC 311 c and d, and KHB (female), MISC 290b and KHB (larva), King 31 (case).

64-66. Male: genitalia, dorsal, ventral and lateral views. 65a: Ventral view of aedeagus. b, c: variations in shape of spine (titillator) and ninth sternite. 67, 68. female: genitalia, lateral and ventral views. 69. Mature larva: head, dorsal. 70, 70a. Larval case: ventral and lateral views. 70b, posterodorsal end of case to show membrane in which distal opening lies. (Figs 64-68 after Barnard 1934, figs 18 g-n.) 71-73. Drawings made from new material of *P. triangularis*. 71. Male: genitalia, lateral (compare with Fig. 66); 71a. Uncinate process (x 400); 71b. Ninth sternite. 72, 73. Female: genitalia, caudal and skewed lateral views; 72a. Variation in shape of tergite. 72b. Supra- genital plate (not to same scale). (a - aedeagus, cl - clasper, ic/icl - internal branch of clasper, p - paramere, pa - preanal appendage, sp - supragenital plate, v - vulva, vg - vagina, vs - vulvar scale, x - hood formed by tenth tergum xt - tenth tergum)

straight apices and wide bases. The claspers are spatulate but longer and basally narrower in lateral view, their internal processes longer, the uncinat spines larger, with basal part apparently coiled like a spring (Fig. 71a). The ninth sternum is widely bifurcate with the arms varying in size (compare Figs 65, 65c, 71, 71b).

The female genitalia (Figs 67, 68, 72, 73) are compared with those of *circularis* (Figs 45, 46). They have the terminal dorsal projection stronger, sub-ovate to subtriangular, not apically indented; paired lateral vulvar scales, each bifid; large median vulvar opening, clearly visible. The supra genital plate is transparent, narrowly bifurcate (Fig. 72b). The vagina is small, sternites apparently showing lightly sclerotized pleural folds.

Setae under hind wings of female are pale, not blackish as in *circularis*.

In comparing Fig. 72 (*triangularis*) with Fig. 45 (*circularis*) note that the scale is the same, but one is a very large individual, the other very small. Although *triangularis* is the larger species, the difference in size range is not great.

#### DESCRIPTION OF LARVA (Figs 69-70)

The larvae fit tightly into their cases and are therefore difficult to extract and as a result their abdomens are frequently not well preserved. The best available larvae (collected from the Langrivier (W Cape) by Dr J.M. King) are those which were preserved in Kahle's fluid immediately after collection but even in these the metanotum and some sterna are poorly preserved and their structure unclear, as are the gills.

The largest available larvae are 6-7 mm in length.

The larva (Fig. 69) is as in *circularis* but the sclerotized parts are more strongly coloured and easier to see, the colour pattern is clearly distinguishable, somewhat different from that in *circularis* (compare Fig. 69 with Fig. 48). In Barnard's material the head and pronotum are brown with faint patterning. In fresh specimens the head shows strong markings similar in type to those in *circularis* but the spots lateral to the frontoclypeal apotome are confluent and the central spots larger and bolder. The mandibles, as in *circularis*, are long in newly ecdysed specimens and worn down in older ones (compare with Figs 55-57). The thoracic nota also show minor differences in patterning. The pronotum has a clear median division and the mesonotal plates are also clearer, as is the metanotum. The larvae do not show a possible metanotal sclerite. No branched abdominal gills were found, but a single pair of simple ventral gills is present on segments 2-6.

#### *Larval case*

The larval case (Figs 70, 70a, 70b) is similar in type to that of *circularis*, but is narrowly triangular in shape, giving rise to the specific name. The sides are nearly straight, the tube wide, round, and the posterodorsal aperture has a central opening in the terminal membrane (Fig. 70b), in some instances on a small chimney. Barnard's drawings of the case must have been made from an unusual specimen, as an incorrect impression is given of the lateral flanges. The case has therefore been re-drawn after comparison with Barnard's original material and the Albany Museum specimens of which there are many.

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

### DESCRIPTION OF PUPA

The pupae like the larvae fit tightly into their cases and are therefore difficult to extract and as a result their abdomens are frequently not well preserved.

The pupa is similar to that of *circularis*. The case is similarly attached to the substratum and widely opened anterodorsally by the pupal mandibles when the pharate imago emerges.

### DISTRIBUTION

South Africa, western and southwestern Cape.

### MATERIAL EXAMINED

#### *South African Museum material*

##### Pinned material

Western Cape: Great Winterhoek Mountains, 4 000 ft. [= 1 219 m] [3319 AC] (KHB and HGW, iii.1933, 1 male without genitalia, 2 females).

##### Material in spirit

Western Cape: Great Winterhoek Mountains, 4 000 ft. [= 1 219 m] [3319 AC] (KHB and HGW, i.1933, 10 larvae in cases, 47 immature pupae, most in cases).

#### *Albany Museum material*

##### Material in spirit

Neotype: western Cape: feeder streams of the Dutoitsrivier, Franschhoek Pass (3319 CC) (MISC 311a: HM, 20.iii.1988, male, to light)

Other material: western Cape: Great Berg River, Assegaibos main stream [3319 CC] (GBG 40c: ADH, 2.viii.1950, larvae); Great Berg River, source, 3 500 ft [= 1 067 m] [3319 CC] (GBG 134e: ADH, 21.xi.1950, larvae); same, 3 000 ft [= 914 m] (GBG 134e: ADH, 21.xi.1950, larvae); Upper Langrivier, tributary of Eerste Rivier [3318 DD] (JMK, iv.1975, 1 pupa; iv-xi.1984, many larvae, and in iv and v. 1975, empty pupal cases); Riviersonderend, French Hoek [Franschhoek] Pass [3319 CC] (MISC 290b: KMFS, 30.i.1976, larvae); feeder streams of the Dutoitsrivier, Franschhoek Pass (3319 CC) (MISC 311b-d: HM, 20.iii.1988, 1 male and 2 females, to light). South western Cape: Vetrivier tributary high on Garcia's Pass, [3321 CC] (MISC 306K: KMFS, 9.ii.1976, larvae).

### MATERIAL CITED IN LITERATURE

Hagen 1864: 225. Swellendam [3420 BB] (larval case) (as *Molanna triangularis* Hagen).

Barnard 1934: 325. Swellendam (Hagen, case only); Great Winterhoek Mts., Tulbagh (KHB and HGW, November 1932, larvae, males and females bred out March 1933); Jonkershoek, Stellenbosch [3318 DD] (HGW); Witte River, Wellington Mts [3319 CA] (KHB, 1922); Bain's Kloof, Wellington

Mts (KHB and HGW, 1 May 1933, females); Hottentots Holland Mts (KHB and HGW, 1932); Du Toit's Kloof, Rawsonville (KHB, 1932); Mostert's Hoek and Waai Hoek Mts [3319 AD] (KHB, April 1933); Bosch Kloof, Keeromberg, [3319 DA], Worcester (KHB, 1930); Cedar Mts, Clanwilliam [3219 AC] (KHB, 1930); French Hoek [Franschhoek] Mts [3319 CC] (KHB and HGW, 1932).

Barnard 1940: 643, Valsch Gat stream on Ceres side of Matroosberg, Hex River Mts, western Cape [3319 BD] (KHB, November 1933, empty cases).

The extant material is listed above under material examined. The only adults Barnard had were males and females bred out from larvae and pupae collected on the Great Winterhoek Mountains at 4 000 ft. [= 1 219 m] [3319 AC]. Of those only two females remain. One is complete and in good condition, with an egg mass adhering to and distorting the apex of the abdomen. One antenna is unbroken. It is almost as long as in the newly collected males. The other female has lost two wings and the abdomen.

*Petrothrincus demoori* sp. nov.

(Figs 74-85)

Holotype male (SCR 4A) here selected and designated, from material in the Albany Museum.

Type locality: southern Cape, Plaat River, tributary of the Karatara River, at Klein Plaat se Brug (33°53'20"S, 22°50'45"E, altitude c 280 m.

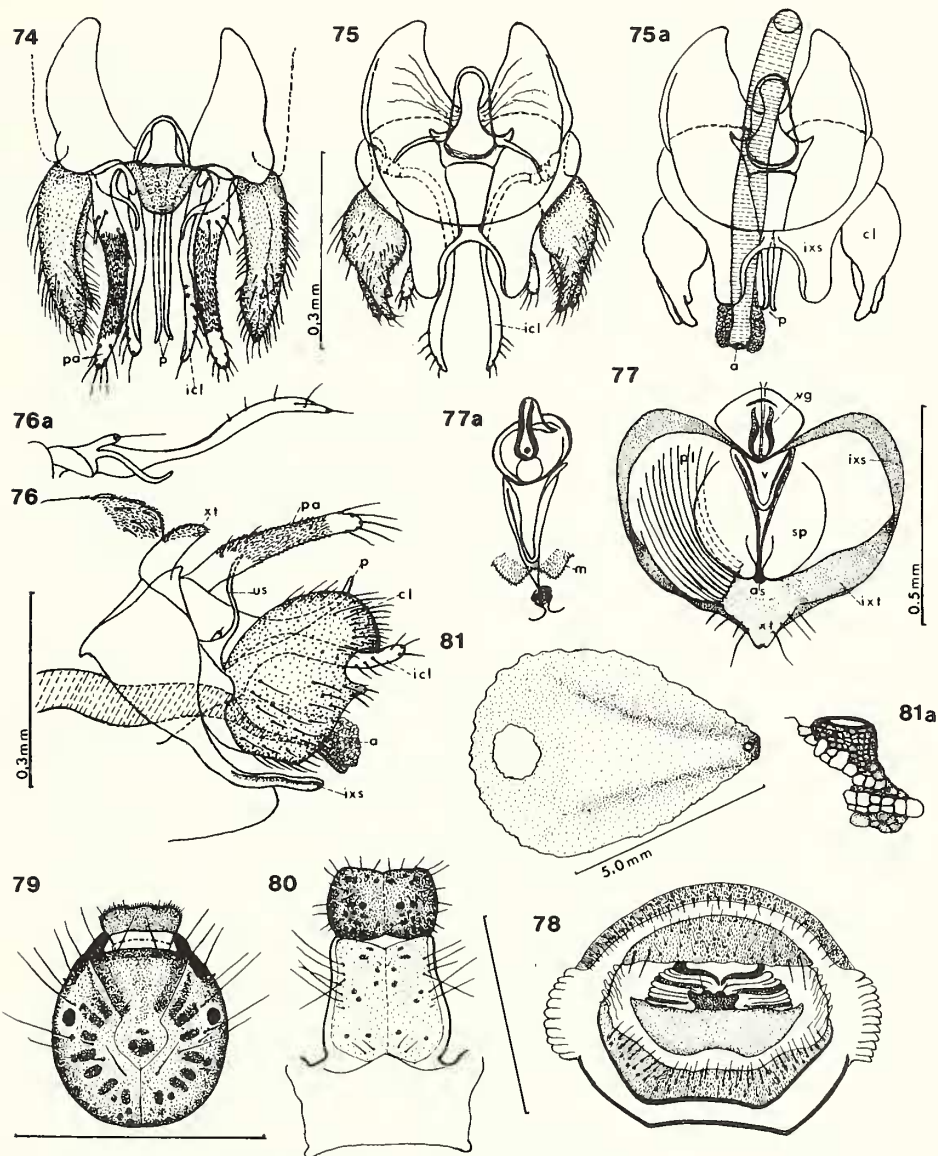
Ten male and six female imagos collected using a light trap at the type locality and putative pupae (SCR 2A and 3C) and putative larvae (SCR 3B) collected from Jubilee Creek, a tributary of the Homtini River (all by Dr F.C. de Moor and Miss H.M. Barber) were at first thought to be *P. circularis* on account of their subcircular larval cases. Both streams are in the same general area in the southern Cape nowhere near the habitats of the two hitherto known species of *Petrothrincus*. On examination the males proved to be a new species of *Petrothrincus*. The larval cases are subovate rather than subcircular (Fig. 81) but there is certainly an overlap between the cases of the two species. The species is named after Dr de Moor.

After study of the specimens, a Holotype male (SCR 4A) was selected and designated by the author. The remaining nine males (SCR 4B, C, D and 4E with 6 males) were designated Paratypes, as were the six females (SCR 4F, 4G - used for S.E.M. micrographs - and 4H with 4 females). The Holotype and the Paratype males and four of the Paratype females are all lodged in the Albany Museum. The remaining two Paratype females were sent to Dr A. Neboiss, Museum of Victoria, Melbourne, Australia.

DESCRIPTION OF IMAGOS (Figs 74-78, 82-85)

The adults are somewhat teneral and in spirit. They are very similar in general appearance to *circularis* and *triangularis*: small, dusky grey insects, length of fore wings 5.4-6.0 mm in males, 5.8-6.8 mm in females. The wings show little trace of lighter and darker patches but this may be due to the teneral nature of the material. The wing venation is very like that in the other two species with a few very minor differences that do not affect the generic diagnosis. In the fore wings, there are, however, long hyaline streaks along the  $R_3+M$  cross-vein, the base of the  $R_{4+5}$  fork and the adjacent part of the lower margin of the discoidal cell, also along M for almost the whole length of the thyridial cell. Such hyaline streaks were not seen in the other two species. Some cross-veins in the hind wings

SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES



Figs. 74-81. PETROTHRINCIDAE: *Petrothrincus demoori* sp. nov., male, female, larva, pupal case

(Scale lines = 1 mm unless otherwise indicated).

Material used: SCR 4A, 4E (male); SCR 4H (female); SCR 3B (probable larvae); SCR 3C (probable pupal case).

74-76. Male genitalia. 74. Dorsal view, omitting aedeagus. 75. Ventral view, winged sternites and claspers with internal processes. 75a. Same: sternites and aedeagus (broken lines), parameres and claspers. 76. Lateral view: preanal appendage, clasper and internal process, uncinat spine, parameres, aedeagus and left side of sternite. 76a. Internal process and uncinat spine further enlarged. 77, 78. Female genitalia. 77. Caudal view, showing sclerotized ring, supragenital plates, vaginal apparatus, etc. 77a. Vaginal process raised up; also setulose membranous covering, shown as seen. 78. Sketch of genitalia as seen in end view; note sclerotized pleural folds resembling a pile of saucers. 79, 80. Larva. 79. Head, dorsal. 80. Thorax, dorsal. 81. Pupal case showing opening left by pharate imago after eclosion. 81a. Lateral view of chimney-like posterior aperture of case. (a - aedeagus, cl - clasper, ic/icl - internal branch of clasper, ixs - ninth sternite, ixt - ninth tergum, m - setose membrane, p - paramere, pa - preanal appendage, pl - pleura, sp - supragenital plate, us - uncinat plate, v - vulva, vg - vagina, x - hood formed by tenth tergum xt - tenth tergum)

are faint, but both these facts could be due to the teneral nature of the material.

Male genitalia (Figs 74-76) are in general typically petrothrincid. They differ from those of the other species as indicated below. Preanal appendages lack both the median expansion of *circularis* and the basal one of *triangularis*, and are not strongly angled; they are minutely setulate. Parameres are basally broad, not narrow, in lateral view (Fig. 76). Claspers are more broadly quadrangular than in either of the other species, with the apical excision small; left and right claspers are very similar, whereas in *circularis* one is larger than the other. The internal process of the clasper is much like that of *triangularis* but the uncinat spine resembles that of *circularis* excepting that it has an additional basal process tipped with a small seta (compare Figs 42 and 71a with Fig. 76a). The aedeagus is very long with a lengthy narrowed apical section bearing a membranous expansion (Fig. 76). The lateral processes of the ninth sternum are strongly winged unlike those of the other two species (Figs 75, 75a).

Female genitalia (Figs 77, 78, 82-85), as might be expected, are very similar in general type to those of *circularis* and *triangularis*. As in those species, they are best seen in caudal view.

The dorsal process and vulva resemble those of *triangularis*, but the lateral striated areas are wider and there appear to be paired vulvar scales (Fig. 84). In caudal view (Fig. 78) these striated areas resemble a pile of saucers. The dorsal process is lightly sclerotized dorsally and this sclerotization extends laterally, embracing the sides of the genitalia (Fig. 77) as in *triangularis*. There is a broad, apically bifid supragenital plate and the ninth tergum and sternum together form a sclerotized ring (Fig. 77). The vagina is hour-glass shaped.

The species are not easily distinguished from one another unless cleared and checked against the figures (compare Figs 45, 72 and 77).

The female supragenital plate was first clearly seen in this species (Fig. 77) (its appearance differs when seen at different angles) and was then found in *triangularis* (Fig. 72b) and in *circularis* (Fig. 45). Scanning electron micrographs of the female genitalia (Figs 82-85) shed further light on the structures. There is an apparently lightly sclerotized, bilobed setose membrane, shown in Fig. 77a, the function of which is unclear. As seen, it lies above everything else, being very clear in Figs 82-85. Also very clear are the ridges on the supragenital plate, and what appear to be the paired vulvar scales (Fig. 84) between the arms of the supragenital plate and the membranous lobe, which is actually ventral to them.

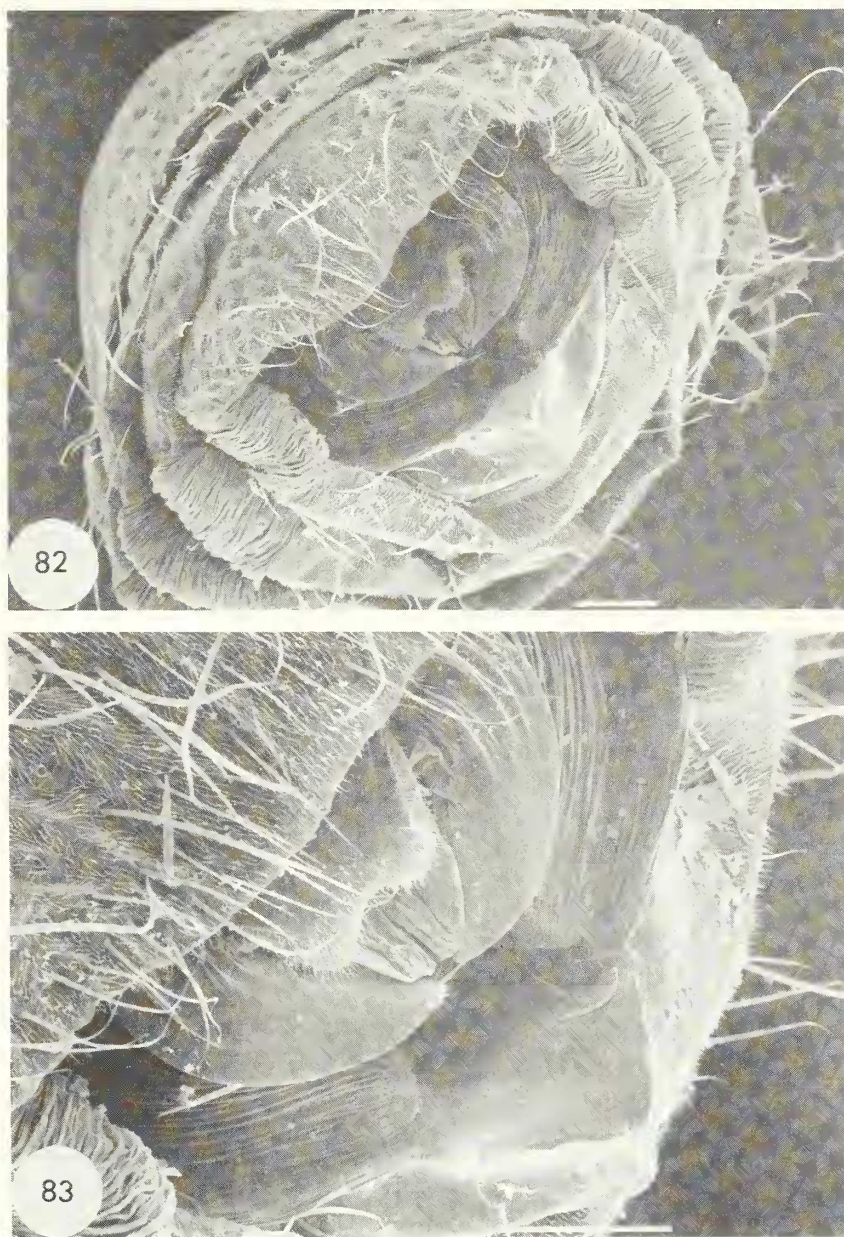
DESCRIPTION OF PUTATIVE LARVA (based on the three available larvae in cases, SCR 3B) (Figs 79, 80,).

Length of mature larva 6.0 - 6.6 mm.

The head pattern (Fig. 79) is of the same type as that of *circularis*, though the frontoclypeal pattern is nearer that of *triangularis* (compare Figs 48, 69 and 79). The pattern on the pronotum shows many more spots than in *circularis*; the mesonotum is very pale, showing a few very small spots, the mid-line is clearly visible; the metanotum is entirely membranous. Abdominal gills resemble those of *circularis* but have longer branches. There are three pairs on the second abdominal segment (2-4-branched), two pairs on the third (2-branched) and one pair each on the fourth and the fifth (2-branched).

#### *Larval case*

Length of case 6.5 - 7.5 mm; sub-ovate, similar to that of *circularis* but on average narrower relative to length. There is a definite overlap in size and shape between the two species. The larval



Figs. 82-83. PETROTHRINCIDAE: *Petrothrincus demoori* sp. nov., female.

Material used: SCR 4G (subsequently lost)

82. Female genitalia, caudal view. Scale line 100  $\mu$ m. Seen in situ with sternites, terga and pleura surrounding it. 83. Same. Scale line 100  $\mu$ m. Note apex of tergum X on right, supra genital plates, and between them, vulvar scales; above them setose membrane.

case is exactly like the pupal case except for the absence of the neat escape aperture (Fig. 81).

#### DESCRIPTION OF PUTATIVE PUPA (SCR 3C, 17 pupae).

The available pupae, all apparently still immature, resemble those of the other two species.

#### *Pupal case* (Fig. 81)

An empty pupal case is figured (Fig. 81) to indicate the size and position of the escape aperture which is much neater than in *triangularis* in which the openings are evidently torn, not cut, leaving a ragged hole with upstanding lateral flaps. The posterior opening is also figured (Fig. 81a) showing the turret. In pupal cases the turret is filled with sand grains (not shown), whereas in the larval case it is open. A turret is not always present.

#### DISTRIBUTION

South Africa, mountain streams in the coastal range of the southern Cape. The original estuaries and lower reaches of the rivers in this region have been drowned so that the present estuaries are preceded by what was originally the middle or upper reaches of the rivers. Consequently the present altitudes of the tributaries are lower than they will originally have been.

#### MATERIAL EXAMINED

##### *Albany Museum material*

##### Material in spirit

Holotype: Southern Cape Province: Plaat River, tributary of the Karatara River, at Klein Plaat se Brug (33°53'20"S, 22°50'45"E), altitude c 280m (SCR 4A: FCdM and HMB, 7-8.iii.1989, male).

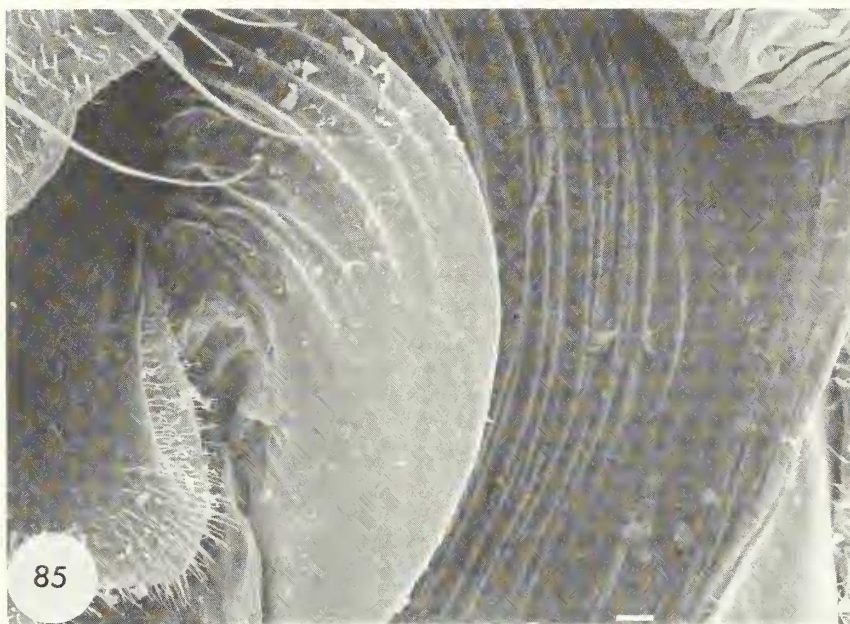
Paratypes: Southern Cape Province: Plaat River, tributary of the Karatara River, at Klein Plaat se Brug (33°53'20"S, 22°50'45"E), altitude c 280m (SCR 4B-H: FCdM and HMB, 7-8.iii.1989, 9 male and 4 female imagos, to light).

Two male Paratypes and one female Paratype will be presented to the South African Museum.

The two of the Paratype females not in the Albany Museum collection were sent to Dr A. Neboiss, Museum of Victoria, Melbourne, Australia, for examination of their tentorial systems. He later wrote (20.i.91) that the tentorium of *demoori* females looks very much like that in the Australian genus *Caloca* (Calocidae), although there are also differences.

Other material: Southern Cape Province: Jubilee Creek (Station Jub. 1.), tributary of the Homtini River, 33°53'20"S 22°58'15"E (SCR 2A and 3C: FCdM and HMB, 7.iii.1989, 17 putative pupae and 15 empty putative cases; SCR 3B: FCdM and HMB, 7.iii.1989, putative larvae); Jubilee Creek (station at picnic spot) (FCdM and HMB, 7.iii.1989, 1 dead putative pupa and 1 empty putative pupal case).

Note: several *Petrothrincus* larvae (MISC 310c) were collected by NK from the Blaauwkrantz (Bloukrans) River, below Staircase Falls [3323 DC], southern Cape. These larvae, however, differ in colour from those of *demoori*, being plain pale brownish, with a few small, vague muscle spots, very hard to distinguish, on the head, none on pronotum (plain brownish) and a few on mesonotum.



Figs. 84-85. PETROTHRINCIDAE: *Petrothrincus demoori* sp. nov., female.

Material used: SCR 4H (subsequently lost).

84. Female genitalia, scale line 10µm. Note lateral ridges on setose membrane, indicating partial sclerotization, and folds on vulvar scales. 85. Same, scale line 10µm. Note ridges on supragenital plate, also pleural folds.

It is unclear whether these represent a colour variation or another species. The former could well be the case as there is a brown colour variation in some of the *triangularis* specimens from the Langrivier (Jonkershoek) material, the larval cases and abdominal gills are similar to those of *circularis* and *demoori* but not of *triangularis*. Male imagos are needed for clarification.

#### BIOLOGY of the genus *Petrothrincus*.

The larvae of all three species are found only in clean, undisturbed streams. Larvae of *circularis* and *triangularis* live in stony runs in high, cold, acid mountain streams. *P. triangularis* appears to be restricted to the higher streams, particularly over 3 000ft [= 914 m] altitude, but *circularis* is also found further down, as far as the upper foothills [300-1 000 ft = 91-304 m]. Excellent detailed accounts of the Great Berg River and its tributaries (geology, water chemistry, collecting stations, with details, vegetation and aquatic fauna) can be found in Harrison and Elsworth (1958) and Harrison (1958 a and b). The southern Cape streams are being progressively disturbed by the planting of exotics, timber extraction and bridge building.

*P. demoori* occurs in places at comparatively low altitudes. De Moor (pers.comm.) noted that *demoori* appears to be restricted to small tributaries as it was not found in the main streams.

*Petrothrincus* larvae are algal grazers, also ingesting detritus and concomitant animalcules. They are present throughout the year. Adults of *P. circularis* have been collected in February, March and April, of *P. triangularis* in March and May, and of *P. demoori* in March. Oviposition has not been observed. Barnard captured several *circularis* females with an egg mass, a round ball covered with the long hairs from the underside of the female hind wings, still attached to the tip of the abdomen.

Barnard (1934) observed the duration of the pupal stage in *circularis* and *triangularis* finding that it lasted from three to four weeks in February and March.

#### KEY to the species of the genus *Petrothrincus*

##### *Male Imagos*

1. Preanal appendages strongly angulate, claspers wider basally than apically, internal branch of clasper with basal lobe, uncinata spine simple; ninth sternum blunt-ended, slightly indented apically (Figs 38-42). . . . . *P. circularis*
- Preanal appendages not angulate, claspers evenly wide, internal branch of clasper lacking basal lobe, uncinata spine not simple; ninth sternum bifid (Figs 64-66, 71). . . . . 2
2. Preanal appendages with basal lobe, without setulae; claspers narrow; uncinata spine with coiled base; ninth sternum narrow with narrow branches of variable length; aedeagus short, blunt (Figs 74-76). . . . . *P. triangularis*
- Preanal appendages without basal lobe, with setulae; claspers broadly quadrangular; uncinata spine without coiled base but with setate basal process; ninth sternum with winged lobes; aedeagus very long, apically narrow in lateral view, broad in dorsal view, with membranous upper part. . . . . *P. demoori*

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

### *Larvae and their cases*

1. Cases subcircular, with wide lateral flanges, larvae with pattern of small spots on head; abdominal gills branched. (Figs 47, 48, 61, 81.). ..... 2
- Cases narrowly triangular, lacking wide lateral flanges; larvae with spots on head confluent; abdominal gills simple (on ventral side only) (Figs 69, 70). ..... *P. triangularis*
2. Pattern of spots on head usually forming paired rows on each side of head; spots on pronotum and mesonotum tending to be confluent (Figs 48, 50, 62, 63). ..... *P. circularis*
- Pattern of spots on head only partly paired, usually forming larger spots in a single row; pattern of small separate spots on pronotum and a few on mesonotum (Figs 79, 80).  
... putative larva of *P. demoori*

Note: in identifying the imagos it is usually necessary to clear the genitalia in KOH, and to study them under a research microscope with a magnification x 100, for some details x 400. The genitalia are very small. For the larvae a stereo microscope with a good magnification is adequate but it is necessary to prop up the larvae on a sand bed to see the top of the head unless the head is taken off. The figures should be used in conjunction with the keys.

### **Family Barbarochthonidae Scott 1985**

Barbarochthonidae Scott 1985: 331, 332 (fig. v), 338; Scott 1986: 231, 234 (table 1), 236.

Type-genus *Barbarochthon* Barnard 1934: 319, 320

The family Barbarochthonidae was erected to accomodate the single genus *Barbarochthon* Barnard. Only one species *B. brunneum* Barnard, is known. It is common in mountain streams in the western Cape Province, is also present, sometimes commonly, in the southern Cape, and has been recorded from Natal.

### RECOGNITION

Imago small, mid to dark brown. Vertex with paired interantennary warts and a large posterolateral pair. Male with 3-segmented maxillary palps carried up over face. Pronotum apparently with a single long wart; mesonotum without paired warts but with a median patch of setae which may be present or absent; scutellum suboval with scattered setae. The most useful identification mark is the conspicuous cream-coloured pronotum without visible separate warts.

## FAMILY DIAGNOSIS

*Imagos*

Ocelli absent; eyes large, glabrous; vertex with pair of small interantennary warts and a pair of large posterolateral warts. Antennae about as long as fore wings in male, shorter in female; scape stout, as long as head; flagellum tapered. Maxillary palps in male 3-segmented, little longer than labial palps, usually carried upturned over face, terminal segment not annulate either in maxillary or labial palps. Maxillary palps in female 5-segmented, longer than labial palps.

Pronotum with a pair of long warts fused medially, appearing single; mesonotum without warts but with small median field of setae and a pair of very small anterior setate spots (all are invisible unless the long setae are still present, those are very easily lost, and in any case seem to vary between specimens, being present or absent or partially present); scutellum suboval, sparsely covered with setae. Middle legs with 6 pairs of colourless spines on first to fourth segments of tarsus. Hind legs with 6 pairs on basitarsus, 2 at end of each segment from second to fourth. Fore wings similar in male and female, discoidal cell closed, median cell open; thyridial cell present; anastomosis very clear, forks 1, 2, 3 present. Hind wings considerably smaller than fore wings, male differing considerably from female; in both sexes, discoidal and median cells absent and the venation much reduced, particularly in the male; in male Sc and R<sub>1</sub> fused, stems of fork 1 and of M and Cu<sub>2</sub> barely indicated, sometimes M completely absent, fork 1 and sometimes 2 present; a patch of androconia between bases of RS and Cu<sub>1</sub>, covered with long setae; in female Sc and R<sub>1</sub> largely separate, forks 1 and 2 present, stalked; base of M absent. Wing coupling by macrotrichia, and in male in addition by thickly placed marginal setae.

Male genitalia with short two-branched pre-anal appendages; tenth segment bifid; claspers strong, unbranched, with basal lobes; aedeagus stout, divided apically into a dorsal bifid lobe and a ventral lobe with apex scoop-shaped.

Female genitalia with short overhanging paired lobes of tenth tergite. Sternites of tenth segment unsclerotized, without appendages.

*Larva*

Case dweller; larva rounded; head and pronotum strongly sclerotized; prosternal horn absent. Head dorsally flattened; frontoclypeal apotome with single pair of indentations; antennae very small, at base of mandibles; eyes medium-sized; mandibles large, strongly sclerotized, other mouthparts small, very hairy; ventral apotomerhomboidal, completely separating genae. Mesonotum less strongly sclerotized than pronotum, particularly posteriorly; metanotum membranous with anterior transverse band of setae. Fore leg stout, middle and hind legs long, with very long claws. Abdomen smooth, lacking lateral fringes and lateral tubercles; first abdominal segment with small dorsal hump, lateral humps each with small setate sclerite, ventrally a tough "lip"; gills absent; ninth segment without dorsal plate. Anal prolegs short, with bases fused, strong sclerites present. Anal claw with a long comb of teeth.

*Larval case*

A long, sometimes very long, tapered tube of dark coloured silk, ornamented with very small sand grains; terminal membrane with circular aperture.

*Male pupa*

Antennae slightly longer than pupa; labrum transversely ovate; mandibles slender, falcate, inner margin faintly serrulate; maxillary palps 3-jointed, with the labial palps reaching just beyond end of metathorax. Middle tarsi fringed; lateral fringes feebly present from end of sixth segment to eighth, with small tufted ends; wing sheaths reach to ninth segment. First abdominal segment without lappets; second to sixth segments with presegmental dorsal plates, fifth segment with postsegmental dorsal plate, all dorsal plates small. Apical appendages slender, straight, rod-like. Genitalia obscured by brown, somewhat sclerotized integument of ninth segment.

*Female pupa*

Similar to male but somewhat larger.

*Pupal case*

Unaltered or shortened larval case closed anteriorly by a membrane with a central boss and transverse slit and having a membrane with a dorsal slit just beyond the pupa; anchored by one or two anterior holdfasts.

**Genus *Barbarochthon* Barnard 1934**

*Barabarochthon* Barnard 1934: 319, 321, figs 1a and 15 a-p.

Type species: *B. brunneum* Barnard 1934 (the only species).

Etymology: Generic name neuter, referring to the early Dutch name for the range of mountains where these caddis were discovered. These mountains were termed the "Holland" or Home of the Hottentots (Barbarians).

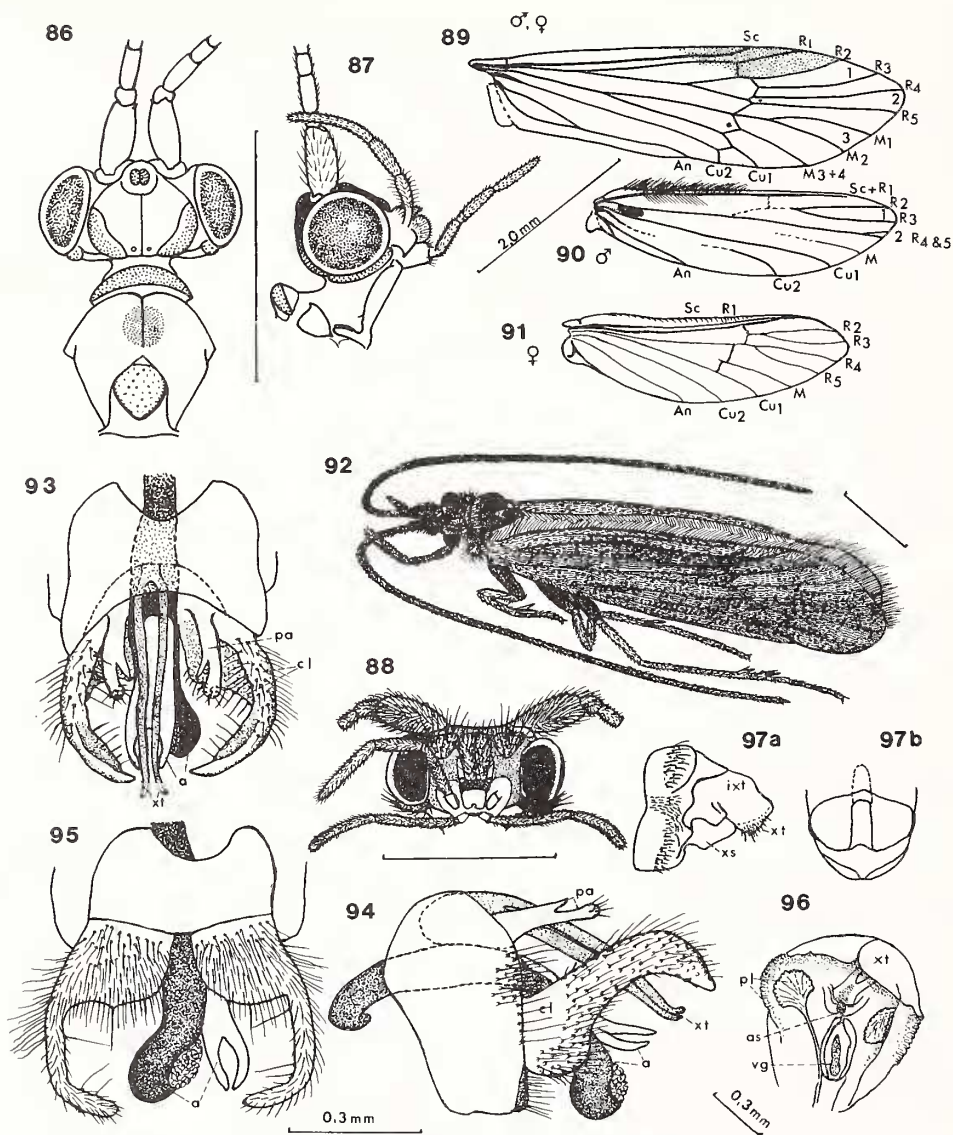
As *Barbarochthon* is a monotypic genus a generic diagnosis is omitted. It is covered by the full description of the species.

***Barbarochthon brunneum* Barnard**  
(Figs 86 - 124)

*Barbarochthon brunneum* Barnard 1934: 319, 321, figs 1a and 15 a-p (male, female, larval and pupal parts, pupal case); Barnard 1940: 643; Harrison and Elsworth 1958: tables 16, 24, 25, 26 (as Sericostomatidae), 207; Harrison 1958a: 260 (as Sericostomatidae); Scott 1985: 338; Scott 1986: 234, 236.

Lectotype male here selected and designated from Barnard's syntypes, South African Museum, Cape Town.

Type locality: western Cape Province, Hottentots Holland Mountains, East side, 4 000ft, [= 1 218 m].



Figs. 86-97. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, male, female

(Scale lines = 1 mm unless otherwise indicated).

Material used: KHB

86. Male: head and thoracic nota, dorsal. 87. Male: head and palps, lateral view. 88. Male: face. 89. Male (and female) forewing. 90. Male hind wing. 91. Female hind wing. 92. Male: entire insect, lateral view. 93, 94, 95. Male genitalia, dorsal, lateral and ventral, showing branches of 10th tergite, pre-anal appendages, claspers and aedeagus. 96. Female genitalia, caudal view. 97a and b. Female genitalia (from Barnard 1934, figs 15g and h, p. 322), a. lateral, b. ventral. (a - aedeagus, cl - clasper, ix - ninth sternite, ixt - ninth tergum, pa - preanal appendage, pl - pleura, v - vulva, vg - vagina, xt - tenth tergum)

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

Barnard did not as rule select types, the specimens in his collection being unmarked apart from name, locality, collector(s) and date. The best male from those specimens listed in his 1934 paper and still remaining in the South African Museum collection has been selected as the Lectotype. The other specimens of the same locality and date are regarded as Paralectotype males and females. The 1916 male has not been designated a Paralectotype as it was glued to its mount in small bits. The extant material and the original records are listed after the descriptions of the various stages.

### DESCRIPTION OF IMAGOS (Figs 86-99)

#### *Male imago* (Figs 86-90, 92-95)

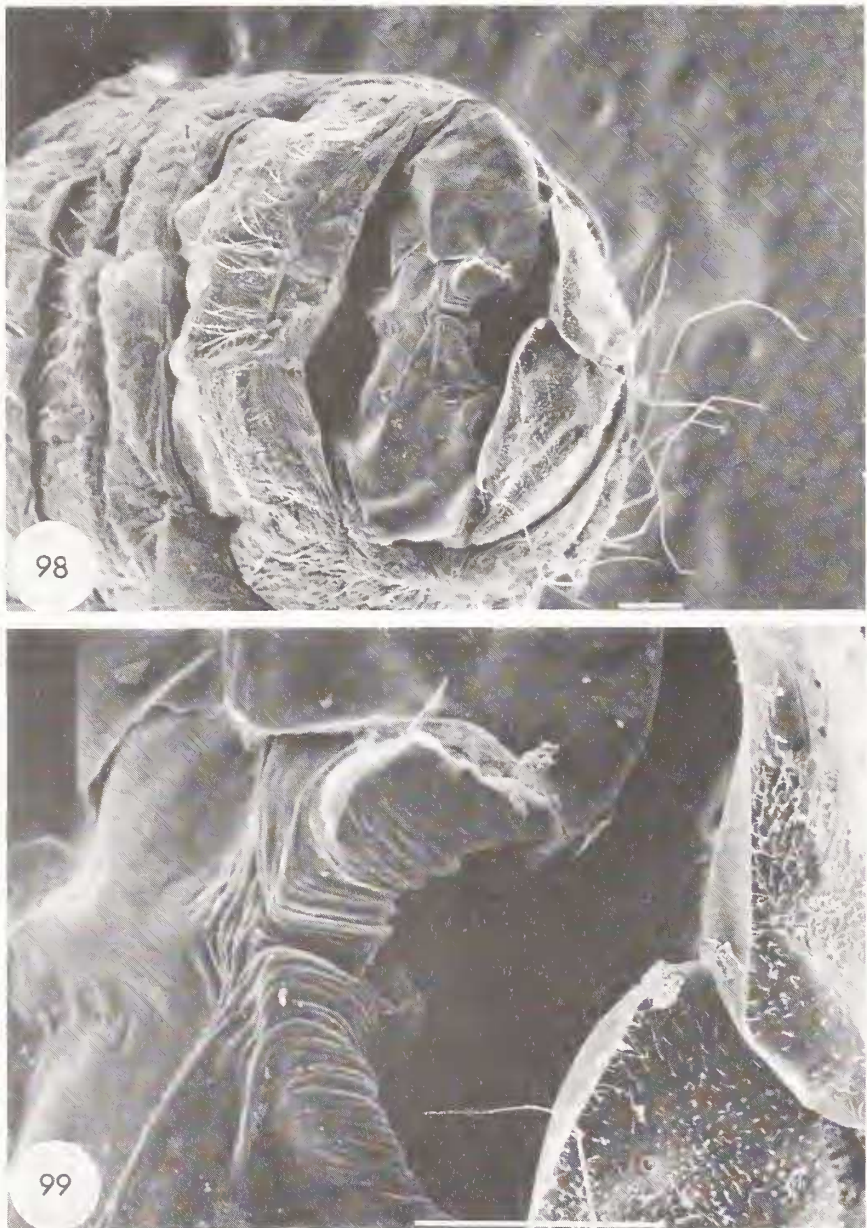
Fore wings 5-6 mm in length.

Colour description given by Barnard (1934) as follows: "Head and thorax dark sepia-brown with paler hairs. Legs and antennae fuscous. Wings brown with pale hairs. Membrane with a clear patch on upper margin of thyridial cell and the cross-vein between  $R_5$  and M, and a spot on the connecting vein [= cross-vein] between  $Cu_1$  and  $Cu_2$ ...". Barnard (1940) added to this a note that fresh specimens, particularly from the Hottentots Holland Mountains, had a pale or white band along the side of the abdomen.

Ocelli absent; eyes large, black, glabrous; vertex with small, paired, contiguous, inter-antennary warts and with posterolateral warts somewhat crescent-shaped; median sulcus present with a small tubercle posteriorly on each side; face with one pair large setose median warts and one pair small lateral warts at antennal bases, these pairs are separated by paired glassy yellow strips. Maxillary palps longer than labial palps; first and second segments together about as long as third, moderately stout, thickly covered with setae. Labial palps 3-segmented; second and third segments subequal, together slightly longer than first. Third segment not annulate in maxillary or labial palps.

Pronotum with a single long wart, evidently representing a fused pair; mesonotum with a median patch of setae and a pair of very small anterior patches, variable in size and presence or absence, practically impossible to see unless the long setae covering them are still present (they are, however, very easily lost and in any case seem to vary between specimens, being present, partially present or absent, as is the case with the Australian family Antipodoeiidae); scutellum with scattered long setae, also difficult to make out unless the setae are still present. Fore wings (Fig. 89) with discoidal cell closed, median open, thyridial present, anastomosis very clear; forks 1, 2, 3 present;  $R_1$  separated from Sc;  $M_{3+4}$  fused;  $Cu_1$  present, simple;  $Cu_2$  connected to  $Cu_1$  by a cross-vein;  $A_2$  joining  $A_1$  near base, meeting margin basal to  $Cu_2$  at arculus. Hind wings (Fig. 90) with venation considerably reduced, variable;  $R_1$  probably fused with Sc (compare with female in which they are separate, Fig. 91), ending before margin and bearing a row of macrotrichia near base; RS complete, continuing as  $R_{4+5}$ ; usually only fork 1 present;  $R_2$  and  $R_3$  present, but only tenuously connected with RS; occasionally  $R_4$  and  $R_5$ , which are normally fused, may be separated apically to form a very small fork 2; M undivided, may be completely absent but, if present, most of its stem is missing or very faint, as are the stems of fork 1 and  $Cu_2$ ;  $Cu_1$  complete, simple; anal short; a cluster of scent scales (androconia) always present between bases of RS and  $Cu_1$ , covered by a dense tuft of setae. Only one cross-vein, sometimes very faint, between Sc +  $R_1$  and faint base of fork 1. Wing-coupling by many strong setae along basal half of hind wings, also by the macrotrichia on SC +  $R_1$ . Jugal lobes large.

Genitalia (Figs 93-95) with short two-branched preanal appendages, the inner branch pointed, the outer with expanded setose tip; tenth segment bifid, forming 2 long slender processes; strong single-jointed claspers each with broad inturned basal lobe (Fig. 95); aedeagus divided towards



Figs. 98, 99. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, female  
(Scale lines = 1 mm unless otherwise indicated).

Material used: KHB

98. Female genitalia, caudal view. Scale line 100  $\mu$ m. Note 10th tergites on right, and very simple genitalia.  
99. Female genitalia, same. Note tergites and apparent curling in of pleura-like folds, into vulva.

middle into dorsal apically bifid lobe and ventral lobe with scoop-shaped apex and membranous in-fill.

*Female imago* (Figs 91, 96, 97, 98, 99)

Female larger than male; fore wings 6.5-7.0 mm in length.

Vertex with setose warts differing slightly from those of the male in position and shape, the interantennary warts being slightly separate and the posterolateral warts being subovate. Antennae shorter and more slender than in male. Maxillary palps 5-segmented, longer than labial palps; both palps smaller than in male.

Fore wing venation as in male; hind wings (Fig. 91) with forks 1 and 2;  $R_1$  largely separated from Sc and, as in male, connected to stem of fork 1 by a cross-vein; RS present, complete; apex of M present, simple, lacking basal part of stem; stem ends just beyond cross-vein;  $Cu_1$ ,  $Cu_2$  and A all present, entire. Wing coupling by macrotrichia. Jugal lobes large.

Genitalia with short overhanging paired lobes of tenth tergites; ninth sternites evidently soft, unsclerotized, not rugose as in Hydrosalpingidae. Genitalia much simpler than in Petrothrincidae. Position of vagina shown in Fig. 96. There are no appendages.

Figs 98, 99 show finely rugose pleura-like folds, evidently within the vulva. In another female the vulvar opening appears to be plugged.

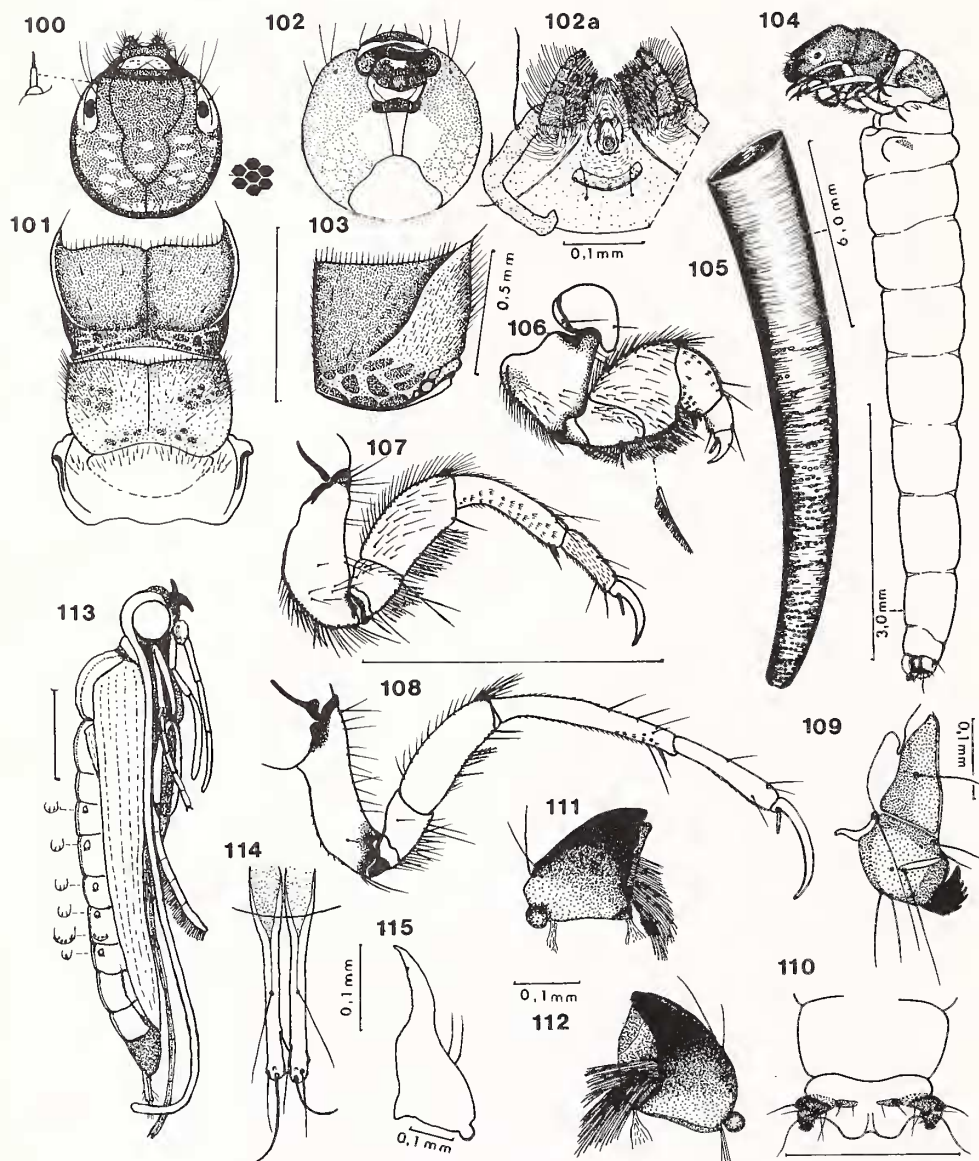
DESCRIPTION OF MATURE LARVA (Figs 100-112; 116-124).

Description from material from the Homtini River, southern Cape, from stones in current (SCR 5A: FCdM and HMB, 8.iii.89; MISC 251a: KMFS and BCW, 27.v.70) compared with Barnard's specimens and drawings.

Length of larva up to 8 mm; larva rounded.

Head dorsally flattened (used to plug case), strongly sclerotized, blackish-brown to rich chestnut in colour, with pigment arranged in an apparent honeycomb pattern (see Figs 100, 102 and 119-121); ventral apotome narrowly quadrangular (Fig. 102), completely separating genae in young larvae, difficult to distinguish posteriorly in older larvae in which only the dark brown anterior bar may be clearly visible. Eyes fairly small, under small clear lenses in white area. Antennae very small (Figs 119-121), on side of head near base of mandibles. Labrum (Fig. 102) small, rounded, partially retractile. Maxillae and labium very tightly packed into a small space behind mandibles; maxillary palps clear, thick, very hairy; stipes and cardo fused forming a single stout structure; labium and labial palps stout, both sets of palps on large bases; a dense brush of setae anterior to labium. Mandibles (Figs 111, 112) very heavy, blackened apically due to strong sclerotization; left mandible with two inner brushes of setae set deep in a hollow; right mandible with a single brush; brushes apparently variable, in some instances right one appears to be missing; both mandibles appear to have a cutting edge and two very long, strong basal ligaments (shown cut short in Figs 111 and 112); setae very strong but not feathered; apex long with three or four teeth when unworn (as in the Petrothrincidae the mandibles may show heavy wear as in Figs 111, 112).

Pronotum strongly sclerotized with carina ending in strong anterolateral points, with strongly marked dark sepia pattern behind carina (obvious on the pale greenish-yellow background), and with small posterolateral divisions seen in lateral view (Fig. 103). Mesonotum with sepia muscle spots on greenish-orange background, less strongly sclerotized particularly on posterior half. Metanotum membranous with anterior band of setae, in colour pale greenish mixed with orange, with small sclerites



Figs. 100-115. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, larva and case, pupa (Scale lines = 1 mm unless otherwise indicated).  
 100, 101. Mature larva, head and thorax, dorsal. 102. Younger larva, head, ventral. 102a. Same. Maxillary and labial palps.  
 103. Pronotum, lateral. 104. Mature larva, habitus, lateral. 105. Larval case. 106. Fore leg and pre-episternum. 107, 108. Middle and hind legs. 109. Anal proleg and claw, lateral view. 110. Anal prolegs, dorsal view. 111, 112. Right and left mandibles, ventral view. 113. Male pupa, habitus. 114. Same, anal appendages further enlarged. 115. Pupal mandible.

as shown in Barnard's drawing of metanotum (Barnard 1934 Fig. 15i) not visible. Pre-episternum large with apex bluntly rounded (Fig. 106). Pleural sclerites with black marks. Legs (Figs 106-108) whitish to pale brown in life with light brown to sepia markings. Fore leg stout; coxa large; trochanter 2 and femur with setal brush along ventral margin but without distoventral process; ventral brush with plumose setae and a few peg-like ones; tibia with small clusters of minute setulae and two blade-like setae on disto-ventral angle, one larger than the other; claw stout, same length as tarsus. Middle leg longer, more slender; trochanter 2 and femur with partly plumose setal fringe; tibia with many minute clusters of setulae; tarsus set with small setae; claw same length as tarsus. Hind leg much longer; coxa slender, curved; femur with a few plumose setae; tibia with a few setulae; tarsus without small setae; claw nearly as long as tarsus. All three claws stout with sharp apex and stout seta near base.

Abdomen (Figs 104, 109, 110 and 122-124) orange-coloured anteriorly, fading and mixing with pale green posteriorly in life, white or cream in spirit; first segment with low dorsal hump, with lateral humps each with small pubescent sclerite, and with ventrally an apparent toughened area or "lip"; ninth segment without dorsal sclerite; anal prolegs short; anal claw very small, with dorsal comb; tenth segment with two small dorsal sclerites of variable length (between anal prolegs), with large, dark, lateral sclerites and ventral sole plates, lacking tufts of setae (Figs 109, 110). Anal claw as seen in the SEM micrographs (Figs 122-124) shows a few teeth of comb just above anal claw, continued round to back as a number of sharp teeth, about 8-10 in all.

#### *Larval case* (Fig. 105)

A long, often very long, slender, curved, tapering, dark-coloured, silken tube, ornamented particularly towards the posterior end with rows of minute sand grains; terminal membrane with circular aperture.

The tube looks more brightly coloured when it contains a live larva as the orange-green colouring of the abdomen and parts of the thorax show through.

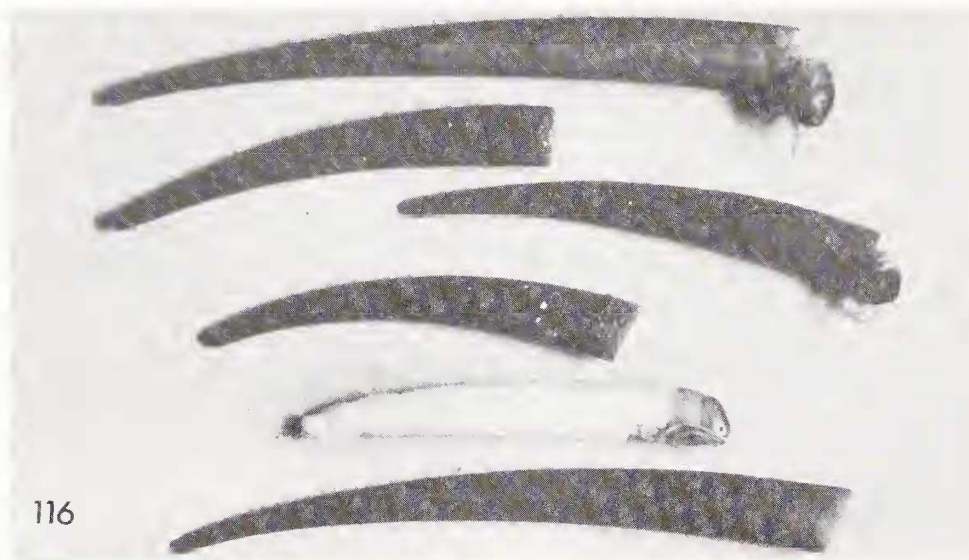
#### DESCRIPTION OF PUPA (Figs 113-115).

##### *Male pupa*

Antennae slightly longer than body. Labrum transversely ovate. Maxillary and labial palps extend to first abdominal segment. Mandibles slender, falcate, inner margin very slightly serrated. Middle tarsi fringed. Lateral fringe present from sixth segment, ending in a tuft on eighth segment. Gills absent. Fore wing sheaths reaching to beginning of ninth segment. Presegmental dorsal plates on second to sixth segments (2 teeth each); postsegmental dorsal plates on fifth segment (4 teeth); ninth segment apparently lightly sclerotized, brown in colour. Anal appendages slender, rod-like, each with a long stout apical seta, and two or three long slender ones.

##### *Pupal case*

At pupation the long posterior end of the larval case is usually cut off and the terminal membrane replaced by a new one with an oval vertical slit; the anterior end is closed by a convex membrane with narrow horizontal slit. Should the end of the larval case not be cut off at pupation, the terminal membrane of the larval case remains and the pupal membrane is formed within the case below the end of the pupa. The pupal case is anchored underneath a stone or on vegetation by one or two anterior holdfasts.



Figs 116-118. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, larvae.

Material used: MISC 270c.

116. Photograph of two larvae in cases, one larva ex. case, and three empty cases. 117. Larva showing dorsal view of head.

118. Lateral view of head and thorax of larva in case. Photographs by J.C. Hodges, Jr.

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

### DISTRIBUTION

South Africa: the western and southern Cape Province, in mountain streams in the coastal ranges; and Natal where it has been recorded from Karkloof, near Howick.

### MATERIAL EXAMINED

*South African Museum material*

#### Pinned material

Lectotype: Southwestern Cape: Hottentots Holland Mountains [3418 BB], 3 500-4 000 ft [= 1 066-1 218 m] (KHB and HGW, i.1933, male).

Paralectotypes: Southwestern Cape: Hottentots Holland Mountains [3418 BB], 3 500-4 000 ft [= 1 066-1 218 m] (KHB and HGW, i.1933, 8 males).

Other material: Southwestern Cape: Hottentots Holland Mountains [3418 BB], 3 500-4 000 ft [= 1 066-1 218 m] (KHB, i.1916, male, glued to its mount in small bits).

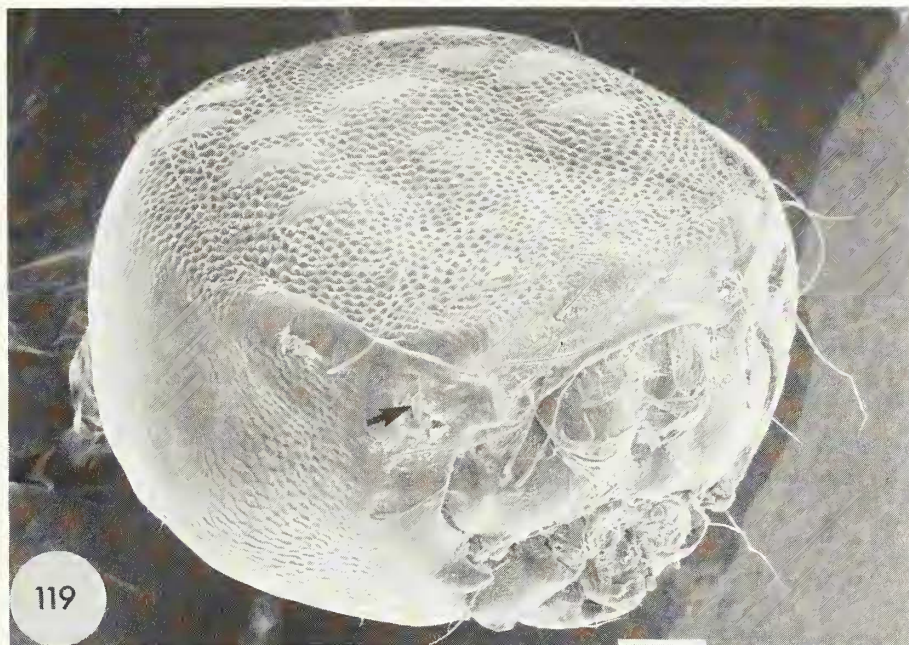
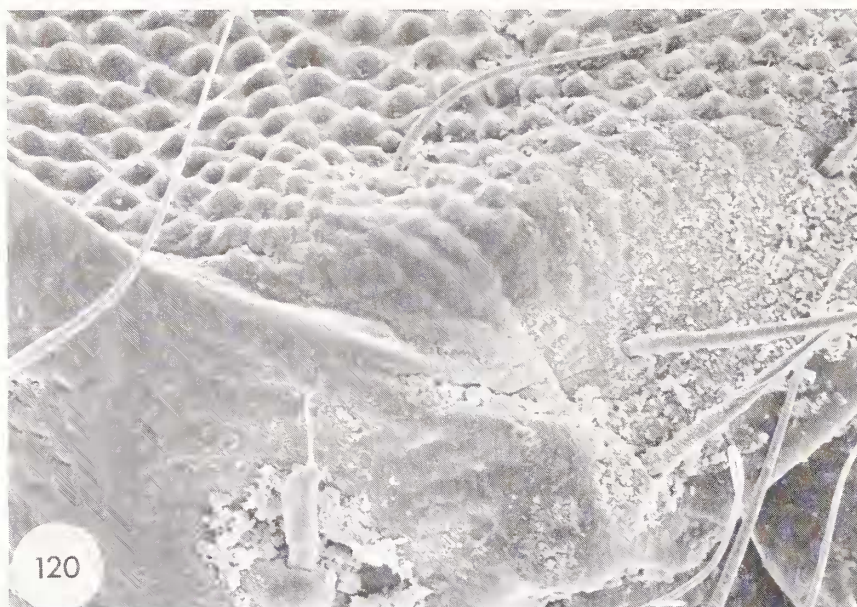


Fig. 119. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, larva.

Material used: MISC 251a.

Scale line 100  $\mu\text{m}$ . 119. Head of larva, to show sculpturing of cuticle, tightly packed mouthparts, and position of very small antenna (indicated by arrow).



Figs. 120, 121. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, larva.

Material used: MISC 251a.

120. Scale line 10  $\mu$ m. Part of head of larva showing antenna. 121. Scale line 10  $\mu$ m, Antenna.

Material in spirit

Paralectotypes: Southwestern Cape: Hottentots Holland Mountains, East side, 3 500-4 000 ft, [= 1 066-1 218 m] [3418 BB] (KHB and HGW, i.1933, 21 males, 12 females).

Other material: Southwestern Cape: Hottentots Holland Mountains, East side, 3 500-4 000 ft, [= 1 066-1 218 m] [3418 BB] (KHB and HGW, i.1933, larvae and few pupae); Wellington Mountains [3318 DB], 3 000 ft, Witte River, Bains Kloof (KHB, ix.1922, 2 males); Cape Peninsula, Table Mountain, Orange Kloof [3318 CD] (KHB, 1.iii.1933, pupal cases, largely empty but with a few pupae). [From the Table Mountain material Barnard (1940) obviously had had imagos, since lost, which he used in establishing its identity.]

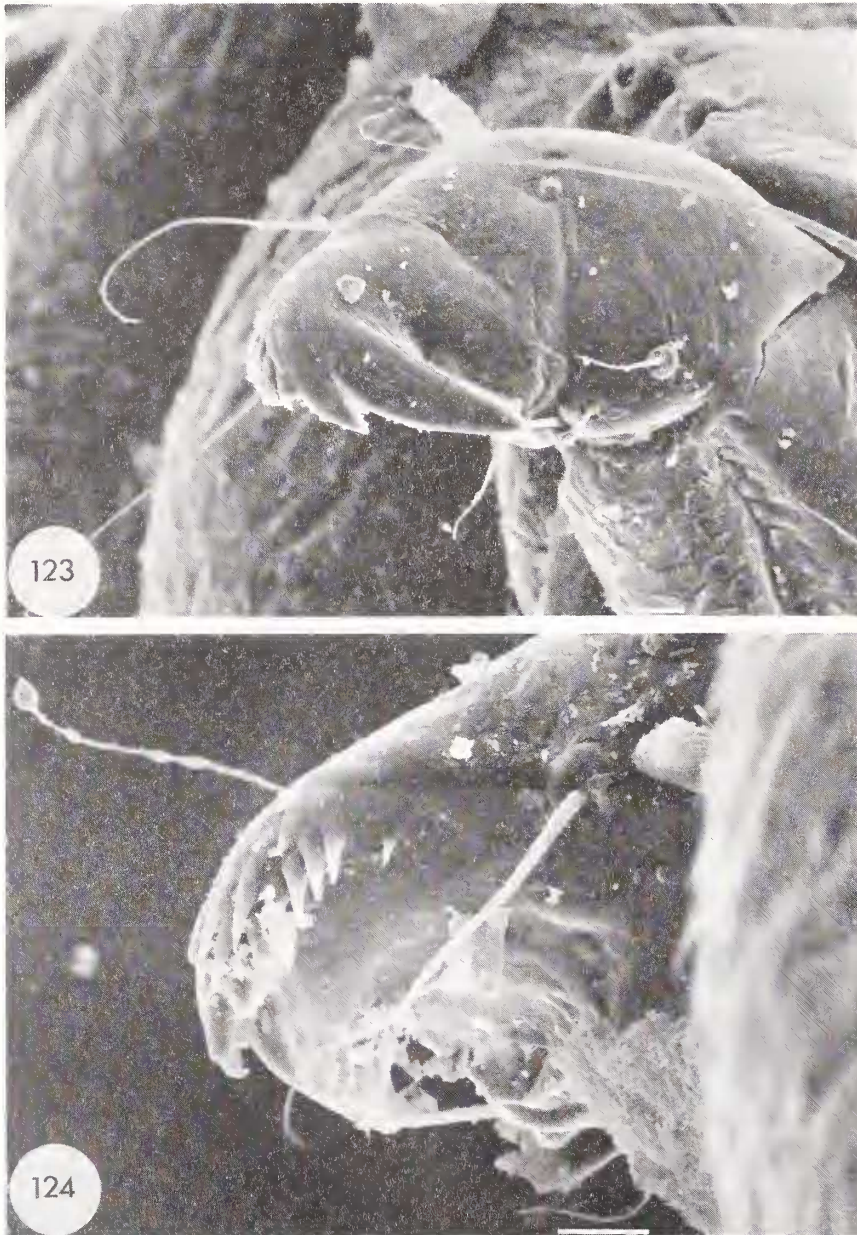
*Albany Museum material*

Material in spirit

Western Cape: Great Berg River, Driefontein [3319 CC], (MISC 89: KMFS, 12.xii.54, 1 male with pupal pelt and case); same (GBG 142B: ADH, 22.xi.50, 1 pupa); Great Berg River, Railway Bridge [3319 CC] (GBG 780, 783: KMFS, x.53, 1 male, 1 female); Great Berg River, Sneeuwgat [3319 CC] (Source; GBG 372A(1): ADH, 28.ix.51, larvae); Great Berg River, Driefontein, (MISC 139: KMFS, 8.x.59, larvae); Great Berg River, Assegaibos [3319 CC] (MISC 288d: KMFS, 30.i.76, 2 larvae); Smalblaar River, tributary of the Breede River, Du Toit's Kloof [3319 CA] (MISC 217: RD,



Fig. 122. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, larva.  
Material used: MISC 251a.  
Scale line 100  $\mu$ m. Posterior segments of larval abdomen showing anal claws (ex. MISC 251a).



Figs. 123, 124. BARBAROCHTHONIDAE: *Barbarochthon brunneum* Barnard, larva.  
Material used: MISC 251a.

123. Larva: Right anal claw seen from outer side, showing long claw with smaller hook and smaller teeth curling round to the inner side. Scale line 100  $\mu$ m, 124. Left anal claw seen from inner side, showing row of teeth curling right round to the inside, making in all a comb with about 8-10 teeth. Scale line 100  $\mu$ m.

## SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

i.1962, 1 larva); Upper Witte, Happy Valley [3319 CA], (MISC 269d: KMFS, 3.x.74, 1 larva); Upper Witte, Happy Valley (MISC 304e: KMFS, 6.ii.76, 2 larvae, 1 pupa); Upper Witte, Happy Valley, higher up, (MISC 270c: KMFS, 3.x.74, 8 larvae); Witte River, Wolwekloof (MISC 291c: KMFS, 30.xi.76, 2 larvae); Witte River, main stream [3319 CA] (MISC 296b: KMFS, 2.ii.76, 23 larvae); Witte River, Leeuklip Kloof tributary [3319 CA] (MISC 267a: KMFS, 3.x.74, 4 larvae); Palmiet River near Elgin [3319 AA] (MISC 48: ADH, 17.xii.52, 1 male); Table Mountain, Disa Gorge, Orange Kloof [3318 CD] (MISC 285g: KMFS and BCW, 27.xi.76, 4 larvae) and (MISC 286d: KMFS and BCW, 27.i.76, 1 prepupa in case); Langrivier, tributary of Eersterivier [3318 DD], Jonkershoek Nature Reserve, Stellenbosch (JMK, different times of the year, larvae); Upper Langrivier (MISC 271b: KMFS, 4.x.74, 2 larvae).

Southwestern Cape: Vetrivier, Garcia's Pass, above Riversdale, tributary near top of pass, below Tolhuis [3421 AA] (MISC 306L: KMFS, 9.ii.76, 1 larva).

Southern Cape: Homtini River, Homtini Pass at road bridge [3322 DD] (MISC 251a: KMFS and FMC, 27.vii.70, 102 larvae); Homtini River, Phantom Pass [3322 DD] (MISC 278e: KMFS, 22.i.76, 10 larvae); Karatara River Jubilee Creek tributary (SCR 2A and 3C and SCR 3B, 6 and 7: FCdM and HMB, 7.iii.1989, putative pupae and larvae); Blaauwkrantz River, Tsitsikama, [3323 DC], 180 m (SU 67: HB, 25.i.59, 4 larvae); Kruis River, [3319 AB] (FRW 164H, 166J, 174D, 183F: ADH and JDA, 8.iii.60, all larvae); Storms River [3423 BB] (FRW 159Z, 186C, 8.iii.60, ADH and JDA, larvae); Kaaiman's River [3322 DC] (FRW 180F: ADH and JDA, 10.iii.60, larvae).

## MATERIAL CITED IN LITERATURE

Barnard (1934): Hottentots Holland Mts., 3 500-4 000 ft (KHB, January 1916, 1 male and KHB and HGW, January 1933, males, females, larvae and pupae); Wellington Mts, 3 000 ft (KHB, November 1922, 1 male); Table Mt, Cape Peninsula, 1 000 ft (KHB, 1st March 1933, 1 pupa, empty cases); Montagu Pass, north of George, Outeniqua Range (HWG, April 1933, larvae) [appear to have been lost].

Barnard (1940): Upper Olifants River, north of Ceres, (KHB and CWT, October, 1937, males and females) [appear to have been lost].

Jacquemart (1963): Bainskloof [=Bain's Kloof] about 10 miles E.N.E. Wellington [the Witte River] [3319 CA]. In the eastern part of the kloof: fast-running stony mountain stream. 12.2.1951. 1 male.

## Additional material

Morse (in litt 16.xii.74), 1 male from Karkloof near Howick, Natal [2930 AC], 27.x.70, H. and M. Townes leg.

## BIOLOGY of genus *Barbarochthon*

Much background information regarding the localities on the Great Berg River can be found in Harrison and Elsworth (1958), as was indicated for *Petrothrincus*. A brief faunistic summary for the Berg River (for Trichoptera see pp. 260-263) is given in Harrison (1958a). In these studies *Barbarochthon brunneum* is usually referred to by name and placed under Sericostomatidae or sometimes Beraeidae. *Barbarochthon* larvae were commonly found from the uppermost zone of the Berg (sponges and cliff waterfalls, altitude from 4 000-5 000 ft [= 1 219-1 514 m]; cliff waterfalls

down to 2 500 ft [= 762 m]); through the Mountain Torrent Zone at 1 000-4 000 ft, [304-1 219 m]; Assegaaibos main stream in the Franschhoek Forest Reserve - Stn 1 at 1 000 ft [= 304 m]; to the Foothill Stony Run Zone at 300-1 000 ft [= 91-304 m], subdivided into two subzones, an upper one which included stations 3 and 5 at Driefontein and the Groot Drakenstein Railway Bridge respectively and a lower one which included at its upper end Station 9 at Simondium (Harrison and Elsworth, 1958, collecting stations shown in Plates X-XII). From the tables of significant animals from stones-in-current, from *Scirpus*, and from marginal vegetation (Harrison and Elsworth 1958: Tables 16, 24, 25 and 26) it seems that *Barbarochthon* larvae are far more abundant in the marginal vegetation than in either the *Scirpus* or the stones-in-current biotopes. In the marginal vegetation they were notably present in considerably higher percentages of the fauna in summer and autumn in the Mountain Torrent Zone (Stn 1) and in spring, summer and autumn in the upper foothills (Stn 3) but always present in lower numbers at both these stations during other seasons. *Barbarochthon* is present in much smaller numbers and only at certain times of the year at Stations 5 and 9, the lowest stations at which it occurred at all.

*Barbarochthon* larvae have also been recorded (see material, above), but not usually commonly, from streams in the southern Cape.

The larvae live mainly amongst marginal vegetation and on submerged or partially submerged clumps of *Scirpus digitatus*. They can be found in both fast current and backwaters. They feed on leaves, crawling about actively at all seasons of the year. They are also present, though much less commonly, on stones in current and are evidently capable of feeding there. They do not, however, use leaves in making their cases which are always of silk and are ornamented with sand grains. The structure of the mandibles bears out the method of feeding, the inner margin having a cutting edge and the sturdy brushes of setae presumably being used to help hold the leaves.

Adults have been collected in the Cape Province in October, November, December and January. A single male was collected at Karkloof near Howick in Natal in October.

## DISCUSSION

Over the years the author has drawn up comparative tables for adults, larvae and pupae in order to compare the genera *Hydrosalpinx*, *Petrothrincus* and *Barbarochthon* with a number of families: both those into which earlier authors attempted to place them, and certain of the Australian families which seemed comparable at least to some degree. The tables were derived from the author's notes and drawings for the three South African genera and from the best sources that could be found for the families considered. Literature consulted in building up the tables and in the preparation of the present paper included Cowley (1976 and 1978), Harrison and Elsworth (1958), Harrison (1958a and b, 1965 and 1978), Lepneva (1966 (1971)), Mosely (1939), Mosely and Kimmins (1953), Neboiss (1977, 1981, 1983, 1984, 1986, 1988 and 1991a and b), Ross (1967 and 1978), Scott (1955), Ulmer (1951 and 1955).

Based on the author's analysis of the literature she selected for comparison the Australian families Helicophidae, Calocidae and Antipodoeciidae as possibly being nearest to the three genera *Hydrosalpinx*, *Petrothrincus* and *Barbarochthon*. To these were added the Bereidae and the Sericostomatidae, primarily because of their repeated linkage with the three in the literature, and the South American family Anomalopsychidae as a Neotropical comparison. It should be mentioned that not all the Australian families had been studied and that a number of other families, for example the Molannidae, Brachycentridae and Thremmatidae, had been included in earlier analyses.

Having placed the three genera in three families, *Hydrosalpingidae*, *Petrothrincidae* and

Barbarochthonidae, it is necessary to set the families in their place in the classification of the Trichoptera. All clearly belong to the Sub-Order Integripalpia Martynov (1924) (see Schmid, 1980, pp. 14-17). All have adults with maxillary palps either 3 or 5-segmented in the male, 5-segmented in the female, and with the last segment simple. The fore wings have the discoidal cell closed, rather long, the median cell open and fork 1 sessile. In the male genitalia the ninth tergum is narrowed, the tenth tergum is somewhat hood-like or present but elongated and forked, the phallic apparatus is provided with an aedeagus, and in the Petrothrincidae with paired parameres. In the female the genitalia are without cerci but may have small apical dorsal appendages, evidently modifications of the tenth tergites. There are definitely separate anal and vaginal apertures and, in the Petrothrincidae, a clear supragenital plate and vulvar scales. The larvae are eruciform and live in portable cases in which they are anchored by their short anal prolegs which in the Petrothrincidae are rather longer than is usual though not as long as in the Annulipalpia.

The division of Integripalpia to which all three appear to belong is the Superfamily Leptoceroidea Schmid (1980). The Leptoceroidea were characterized by Flint (1981, quoting Ross, 1967) as having lost their ocelli, the male fore wings retaining  $M_4$  in primitive families, the supratentorium reduced and larval pronotum without a crease. The last appears to suggest a posterior suture of the pronotum as opposed to an anterior suture in the Limnephiloidea. Flint (1981), however, could find no consistent pattern in this, with which the present author agrees. In fact some taxa within one group may have both, others neither. Flint further characterized the leptocerid branch (the Leptoceroidea Schmid) as having larvae which lack a prosternal horn, have bifid tubercles on the eighth abdominal segment only, and lack a strongly sclerotized dorsal sclerite on the ninth abdominal segment. None of the three South African families has a prosternal horn. In the Hydrosalpingidae there are bifid tubercles on the eighth segment only and a weak dorsal sclerite on the ninth segment. Neither of the other two families has either bifid (lateral) tubercles or a dorsal sclerite on the ninth segment. It should be noted that, in southern Africa at least, certain genera of Leptoceridae (for example, *Setodes*, *Trichosetodes* and *Leptecho*) do have a dorsal sclerite on the ninth abdominal segment, in some cases strongly sclerotized. Judging from the illustration in Wiggins (1977), the North American *Setodes incertus* (Walker) also does. On the other hand, many leptocerids do not, so that it would not seem to be a good distinguishing character for the Leptoceridae, and therefore for the Leptoceroidea.

Weaver (1983, 1984), in his proposed classification of the Trichoptera, splits Schmid's Leptoceroidea into Sericostomatoidea Stephens (1836) and Leptoceroidea, both included in his new Infraorder Brevitentoria. Schmid (1980) indicated this division in his phyletic tree by its branching. In such a split the Hydrosalpingidae, Petrothrincidae and Barbarochthonidae would all fall into the Sericostomatoidea rather than the Leptoceroidea. This is indicated by the apparent relationship of all three to the Australian families Helicophidae, Calocidae and Antipodoeciidae, and possibly of the Hydrosalpingidae and Barbarochthonidae also to the Beraeidae. The characters given by Weaver, however, are so few as to render comparisons difficult. Certainly all three families share with his Sericostomatoidea adults with tibial spurs 2, 2, 4 (in common with many southern hemisphere families and certain others) and lacking ocelli, and larvae which are phytophagous. In the larva the pre-episternum (Weaver's trochantin), however, is not small but large in both Petrothrincidae and Barbarochthonidae and is normal in Hydrosalpingidae, and the tergite on the ninth abdominal segment is present, although weak, in Hydrosalpingidae but is absent from the other two families.

Incidentally, Weaver gives the larvae of his Sericostomatoidea as phytophagous and those of Leptoceroidea as predatory. In fact most southern African Leptoceridae show the whole gamut of feeding habits from purely phytophagous to mainly carnivorous, the latter being rare. The related Calamoceratidae are certainly plant-eaters.

Although the Hydrosalpingidae, Petrothrincidae and Barbarochthonidae were individually compared with the Brachycentridae and the Thremmatidae there seems to be no point in drawing comparisons between them, since the latter families fall into the Limnephiloidea not the Leptoceroidea (*sensu* Schmid). Molannidae falls into the leptocerid branch rather than the sericostomatid branch of the Leptoceroidea and so no detailed comparison between it and the three families is necessary.

In the present paper Dr F. C. de Moor, using cladistic analyses, has compared the Hydrosalpingidae, Petrothrincidae and Barbarochthonidae with the families in Weaver's Sericostomatoidea and with the Antipodoeciidae.

The original decision to treat the three genera *Hydrosalpinx*, *Petrothrincus* and *Barbarochthon* as each belonging to a new family is supported by the cladistic analyses. The three families do appear to fit into the Sericostomatoidea, as may be seen in both analyses (Figs 125, 126). It appears from the cladogram based on 44 characters (Fig. 126) that the closest relatives of the Hydrosalpingidae are all Australian or South American and those of Barbarochthonidae and Petrothrincidae are the Beraeidae and Antipodoeciidae. These are of course preliminary results, however, it is of interest that this cladogram separates out into two branches, one almost exclusively Australian, the other almost exclusively non-Australian, with the South African families divided between the two.

#### ZOOGEOGRAPHICAL NOTE

Ross (1967), when discussing the origin of the fauna of Eurasia-Africa-Madagascar, referred to two of these endemic South African genera, *Petrothrincus* and *Hydrosalpinx*. He queried whether they, together with *Paulianodes* (Philopotamidae) and the Pisuliidae, were not survivors of the Cretaceous or more recent immigrants that had become extinct in their original, unknown home, or were not even older lineages arising from ancestors that had reached Africa or Madagascar perhaps as early as the Jurassic.

*Petrothrincus*, *Hydrosalpinx* and *Barbarochthon* of the presently defined families Petrothrincidae, Hydrosalpingidae and Barbarochthonidae are all endemic to South Africa and indeed, almost entirely to the Cape Province, where they are found in the acid mountain streams of the western Cape coastal folded belt and in its extension into the southern Cape. In this area there are many relicts of the cool-adapted Gondwanaland fauna to which the present three families most probably belong (see also Scott, 1986). This is borne out by the close linkage (Fig. 126) of the Hydrosalpingidae with the Helicophidae, a family also found in South America and Australia.

In early Jurassic times, over two hundred million years ago, Africa lay well to the South of where it lies now (Harrison, 1978 and W. J. de Klerk, pers. com.), still linked with Antarctica, Australia and South America to the South. What is now our south-west coast would have been much cooler and wetter. It would have formed a southern part of the very large continent, Gondwanaland, of which the northerly parts were becoming subtropical and then tropical as they slowly drifted northwards. Gondwanaland finally broke up in the late Jurassic and the continents eventually reached something like their present positions.

Many cool-adapted caddisflies must have become extinct as the climate warmed up, but quite a number did survive: in addition to the Hydrosalpingidae, the Petrothrincidae and the Barbarochthonidae, certainly also the southern African Sericostomatidae (6 genera), many species of *Athripsodes* (Leptoceridae) and certain genera, for example, *Leptecho* (also Leptoceridae), and the hydropsychid genus *Sciadorus*.

Ross (1967) was therefore correct in tentatively placing *Petrothrincus* and *Hydrosalpinx* as survivors of the Cretaceous rather than as more recent immigrants. They might indeed have an older

lineage, perhaps from the Jurassic or even earlier as was also suggested by Ross. Ross could quite justifiably have included *Barbarochthon* with them. Wiggins (1984) suggested that the origins of the Trichoptera could have been in the early Mesozoic or even the Permian (in the Palaeozoic). Whenever they originated, it must have been prior to the final break-up of the southern continents in order for there to be links between some of the southern families found on the present day continents of South America, South Africa and Australia.

#### A CLADISTIC ANALYSIS OF CHARACTER STATES IN THE TWELVE FAMILIES HERE CONSIDERED AS BELONGING TO THE SERICOSTOMATOIDEA (by F. C. de Moor)

A cladistic analysis of the states of a number of characters of the three recently erected endemic South African families of Scott (1985), the Antipodoeciidae and the 8 families recognised as belonging to the Sericostomatoidea Stephens (1836) *sensu* Weaver (1983) was carried out. For the analysis 59 characters (from the larvae, pupae and adults) each with two to several possible states, were chosen (Table 1). Characters were selected from morphologically useful identification features within these twelve families that appear to belong to the Sericostomatoidea. They were chosen irrespective of whether they were shared by members of the three new South African families or were considered to contribute to a phylogenetic evaluation of the families. Characters considered as plesiomorphic were given a state of 0, and numerical values for the other characters assumed that they were derived. Where the primitive or derived status of characters could not be decided upon enumeration of character states commenced with one. The family Anomalopsychidae was chosen as the outgroup as it was the only family in the Sericostomatoidea with ocelli and showed the highest number of character states considered as being plesiomorphic. The full selection of characters is not included for this preliminary analysis as it is still being refined and will be presented when an analysis of the genera of these families can be conducted.

In a number of instances characters showing several states were found within one family (see Table 1 for definition of characters). For the Sericostomatidae wing venation characters were shared with the three endemic South African families and Antipodoeciidae (forks 1, 2, 3 present in male fore wings), or with the Calocidae, Conoesucidae and Anomalopsychidae (forks 1, 2, 3, 5), or only with the Chathamidae (forks 1, 2). Likewise for the forks in the male hind wings alternative character states existed in the Sericostomatidae (states 1 or 2), Barbarochthonidae (states 3 or 4), Beraeidae (states 5 or 7), Helicophidae (states 6 or 7), Calocidae (states 1 or 4), Anomalopsychidae (states 1 or 2), Conoesucidae (states 5 or 7) and Helicopsychidae (states 1 or 4). The development of the male maxillary palps also showed variation within one family and states 0, 1 or 2 were found in the Sericostomatidae, states 0 and 1 in both the Calocidae and Anomalopsychidae and states 1 and 2 in both the Conoesucidae and Helicopsychidae. In the cladistic analysis it was assumed that if the most primitive state of a character (e.g. the highest number of segments in the maxillary palps and the fullest complement of cells in the wings) occurs in genera of a particular family, it is the general state of that character for that family.

An analysis on this set of 59 characters using Hennig86 version 1.5 (Farris, 1988) determined shared characters in the twelve families without prior selection for any criteria. This produced two trees indicating parsimonious relatedness amongst the terminal taxa (Fig. 125). The Petrothrincidae, Barbarochthonidae and Hydrosalpingidae group closely together in both trees. These three families appear most closely related to the Helicophidae and Conoesucidae in the first tree and the whole cluster of families then shows close relationship to the Beraeidae. The second tree shows the three endemic South African families are apparently related to a cluster of families made up of the Beraeidae,

TABLE 1. The description of the status of 59 selected characters of larvae, pupae and adults from the eight presently described families of the Sericostomatoidea plus the three new families and the Antipodoeciidae. A status of 0 represents the primitive plesiomorphic state for a character. States such as 1,2 etc. represent derived apomorphies, usually but not always in a hierarchical phylogenetic order. Where the primitive or derived state of a character could not be reasonably estimated valuation of character states commence with one.

LARVAE	
1.	Head; shape round 0, shape oval 1
2.	Head; without carina 0, with carina 1
3.	Antennae; near base of mandibles 0, midway between eyes and base of mandibles 1, close to eye 2
4.	Shape of ventral apotome; an equilateral triangle 1, an elongated triangle 2, quadrate or oval 3
5.	Ventral apotome; entirely separates genae 0, separates genae anteriorly only 1
6.	Pronotum; one single plate may be partially divided 1, one pair of large plates 2
7.	Pronotum; without a carina 0, with a carina 1
8.	Pronotum; with a posterior division 1, without a posterior division 2
9.	Pre-episternum; large and prominent 1, small and inconspicuous 2
10.	Pre-episternum; with upturned pointed apex 1, with blunt apex 2
11.	Mesonotum; a single plate 0, a pair of plates 1, more than two plates or sclerites 2
12.	Metanotum; one pair of small plates 1, membranous with setae 2, with more than two plates 3
13.	Forelegs; long and slender 0, short and stout 1
14.	Foreleg tarsal claw; shorter than tarsus 0, approximately as long as tarsus 1, longer than tarsus 2
15.	Midlegs; long and slender 0, short and stout 1
16.	Midleg tarsal claw; shorter than tarsus 0, approximately as long as tarsus 1
17.	Hindlegs; long 0, short 1
18.	Hindleg tarsal claw; shorter than tarsus 0, approximately as long as tarsus 1
19.	Abdomen with; small dorsal hump 0, large dorsal hump 1, lateral humps only 2
20.	Lateral abdominal humps with; setose sclerites 1, no sclerites or setae 2
21.	Ninth abdominal segment; with sclerite 1, with no sclerite 2
22.	Abdomen with; simple and branched gills 0, simple gills 1, no gills 2
23.	Eighth abdominal segment; with lateral tubercles 1, with no lateral tubercles 2
24.	Lateral abdominal fringe of setae; present 1, absent 2
25.	Anal prolegs; forming an apparent 10th segment 1, separated 2
26.	Anal claw with; 2-3 dorsal hooks 1, a dorsal comb 2
27.	Larval case; tubular and tusk shaped 0, limpet or shell shaped 1
28.	Larval case constructed of; pure silk 0, silk with some embedded sand grains 1, fine sand grains 2, a mixture of sand and plant matter 3, coralline or other algae 4
PUPAE	
29.	Antennae in male; shorter than body 0, as long as body 1, longer than body 2
30.	Antennae in female; shorter than body 0, as long as body 1, longer than body 2
31.	Inner margin of mandibles; feebly serrate 1, dentate 2
32.	Wing sheaths reach end of abdominal segment; five 1, six 2, seven 3, eight 4,
33.	No swimming fringes on tarsi 0, mid tarsi only fringed 1, fore and mid tarsi fringed 2
34.	Presegmental plates on abdominal segments; two to six 1, three to six 2, no plates present
35.	Post segmental plates on abdominal segment five with; one or two hooks 1, three hooks 2, two to four hooks 3
36.	Lateral fringe of abdominal setae on segments; six to eight 1, seven and eight 2, no lateral fringe of setae 3
37.	Pupal case anchored; around margin of case 1, by one or more anterior holdfasts 2

Table 1 continued on page 349

# SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

Table 1 continued from page 348

ADULTS	
38.	Antennae; shorter than length of forewing 0, same length as forewing 1, longer than length of forewing 2
39.	Maxillary palps in male; five segmented 0, three segmented 1, one or two segmented 2
40.	Ocelli; present 0, absent 1
41.	Facial warts; one pair at antennal bases 1, two pairs at antennal bases 2, one pair and median patch of setae at antennal bases 3
42.	Pronotum with; two pairs of warts 0, one pair of warts 1, single large wart (fused) 2
43.	Mesonotum with; one pair of warts 1, median field of setae 2, two lateral strips of setae 3, one or two setae only 4
44.	Mesoscutellum with; one pair of warts 0, a single large wart 1
45.	Leg spines; colourless 1, some black 2
46.	Thyridial cell in forewing; present 0, absent 1
47.	Androconia; absent 0, present on head 1, present on forewing 2, present on hindwing 3, present on fore and hindwing 4
48.	Discoidal cell in forewing; closed 0, open 1, absent 2
49.	Median cell in forewing; open 1, absent 2
50.	Sc and R1 in forewing; separate 0, joined 1
51.	In male forewing presence of forks: one to five 0; one, two, three and five 1; one and two 2; two and five 3; one, three and five 4; two or two and four 5; one, two and three 6; one and three 7
52.	In female forewing presence of forks: one, two, three and four, or one, two and five 1; one, two, three and five 2; one, two and three 3; one and two 4; two and five 5; two, four and five 6; one and three 7
53.	Jugal lobes in hindwing; large 0, small 1, absent 2
54.	In male hindwing presence of forks: one, two and five 1; two and five 2; one and two 3; one 4; two 5; five 6; none 7
55.	Wings; with no apparent coupling device 0, coupled by macrotrichia 1, coupled by hamuli 2
56.	Parameres on male genitalia; absent 0, present 1
57.	Male pre-anal appendages; with basal branch 1, unbranched 2, absent 3
58.	Female genitalia with vagina; sclerotised 1, not sclerotised 2
59.	Ninth abdominal sternite; separate from tenth 0; fused to tenth 1

Helicophidae and Conoesucidae. In both trees this grouping of families appears closest to the Antipodoeciidae.

It appears that certain synapomorphies link the three South African families (Table 2 characters 14, 29, 51 and 53).

Unfortunately the pupae of Antipodoeciidae are at present unknown which results in many missing characters being introduced into the analysis leading to a lack of resolution (Platnick, Griswold and Coddington, 1991). To overcome this problem all the pupal characters and a number of other characters for which character states in several of the families were missing were excluded and a cladistic analysis on only 44 characters was carried out (Fig. 126).

The most parsimonious single tree produced (Fig. 126) indicates a set of relationships rather different from that in Fig. 125. The Hydrosalpingidae are most closely related to the Helicophidae and these two families are then most closely related to the Conoesucidae. This cluster of families is related to the Chathamidae and Calocidae. The family Petrothrincidae is closely related to the Barbarochthonidae which, however, appears most closely related to the Beraeidae which in turn are most closely related to the Antipodoeciidae. This cluster of families is most closely related to the Helicopsychidae and Sericostomatidae.

This second analysis is interesting because the Helicophidae are found in both Australasia and the Neotropical Region. It suggests that the Hydrosalpingidae are more closely related to the Australasian and South American families than to the other two South African families. This would strengthen the hypothesis of a temperate Gondwanaland ancestral origin of these families. A more

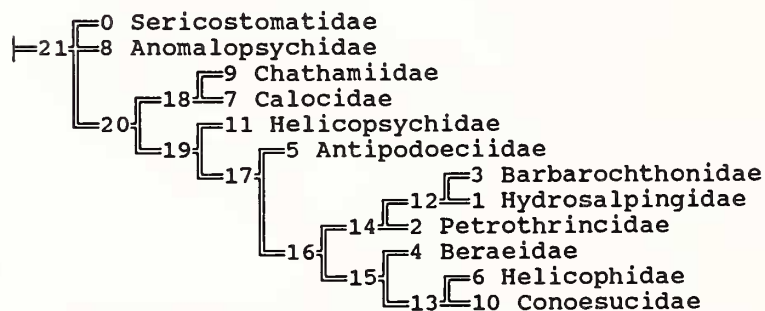
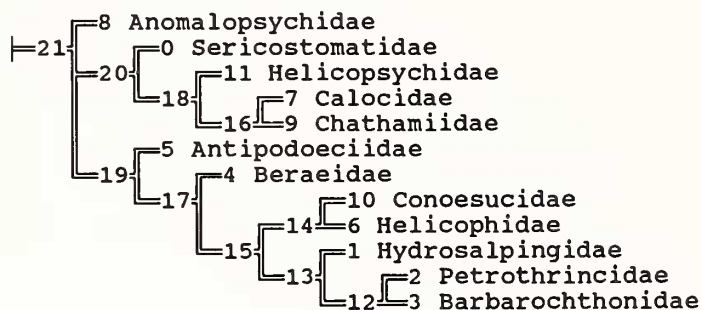


Fig. 125. Cladograms showing two possible relationships of the presently considered twelve families of Sericostomatoidea. Analysis based on 59 selected characters (Table 2).

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mhennig length 188 ci 41 ri 37 trees 1
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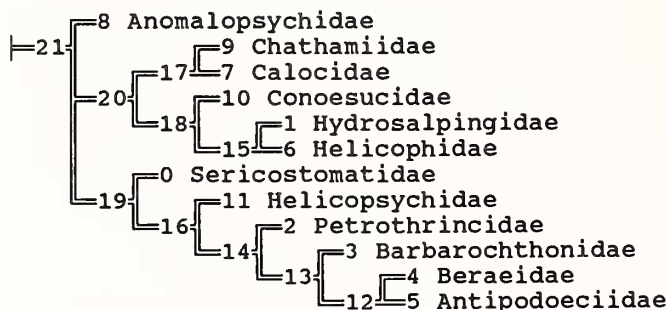


Fig. 126. Cladogram showing the possible relationships of the presently considered twelve families of Sericostomatoidea. Analysis based on 44 selected characters. Character states 18, 20, 29-37, 41, 45, 58 and 59 (Table 2) were left out for this analysis.

SCOTT: THREE RECENTLY ERECTED TRICHOPTERA FAMILIES

TABLE 2. The status of 59 selected characters in the larvae, pupae and adults of the eight presently described families of the Sericostomatoidea plus the three new families and the Antipodoeciidae. Where there are variations for a character state within one family the most plesiomorphic state for that character in the family is chosen. (See Table 1 for explanation of character states). Abbreviations in the table refer to: Serico = Sericostomatidae, Hydro = Hydrosalpingidae, Petro = Petrothrincidae, Barba = Barbarochthonidae, Berae = Beraeidae, Antip = Antipodoeciidae, Helico = Helicophidae, Caloc = Calocidae, Anoma = Anomalopsychidae, Chat = Chathamidae, Cono = Conoesucidae, Heli = Helicopsychidae. .S:6

Characters	Serico	Hydro	Petro	Barba	Berae	Antip	Helico	Caloc	Anoma	Chat	Cono	Heli
<b>LARVAE</b>												
1 Head shape	1	1	0	0	0	0	1	0	0	1	0	1
2 Head carina	1	0	0	1	1	0	1	0	1	0	1	1
3 Antenna pos	1	0	0	0	1	1	1	2	-	1	1	1
4 Vent apo shp	2	1	3	3	3	1	2	1	1	-	3	1
5 Genae sep	1	1	0	0	0	0	0	1	0	-	0	1
6 Pronot pls	1	1	1	1	1	1	1	1	1	1	1	1
7 Pron carina	0	0	0	1	1	1	0	0	1	0	0	0
8 Pron div	1	2	2	1	1	1	2	2	-	2	2	2
9 Pre epi size	1	2	1	1	1	-	2	2	2	2	1	2
10 Pre epi shp	1	1	1	2	2	-	1	1	1	1	2	1
11 Meso plates	1	1	1	1	0	1	2	1	0	1	1	1
12 Meta plates	3	1	2	2	2	2	3	2	1	3	3	3
13 Foreleg size	1	1	1	1	1	1	1	1	1	1	1	1
14 Claw size	1	1	1	1	1	-	2	1	0	2	2	0
15 Midleg size	0	0	1	0	0	1	1	0	0	0	1	0
16 Claw size	1	1	0	1	1	-	1	0	0	0	0	3
17 Hindleg size	0	0	0	0	0	1	1	0	0	0	0	0
18 Claw size	0	0	0	1	0	-	1	0	0	0	0	0
19 Abd hmps	2	0	1	1	0	-	0	0	2	1	0	2
20 Setal scler	1	1	2	1	2	-	2	-	2	2	2	-
21 9th abd scler	2	1	2	2	2	-	2	2	1	1	1	2
22 Abdom gills	1	2	0	2	0	2	2	2	2	0	0	1
23 Lat tuberc 8	1	1	2	2	1	1	1	1	2	1	1	2
24 Lat fringe seta	2	2	2	2	1	2	2	2	2	2	2	2
25 10 abd proleg	1	1	2	1	1	1	1	1	1	1	1	1
26 Anal claws	1	1	2	2	1	1	1	1	2	1	1	2
27 Case shape	0	0	1	0	0	0	0	0	0	0	0	1
28 Case struct	2	0	2	1	2	2	3	3	2	4	1	2
<b>PUPAE</b>												
29 M pup antenna	1	2	2	2	1	-	0	0	1	0	1	0
30 F pup antenna	1	2	0	1	0	-	0	0	1	0	1	0
31 Pup mandibles	1	2	1	1	1	-	2	1	2	1	1	1
32 Wing sheaths	2	2	3	4	1	-	-	-	4	-	-	-
33 Leg fringes	2	1	2	1	0	-	1	-	0	2	1	2
34 Preseg plates	2	1	2	1	3	-	2	2	2	2	2	2
35 Postseg pls	3	2	1	3	0	-	3	1	3	2	3	2
36 Ab setal fringe	3	2	3	2	3	-	1	2	3	3	1	3
37 Pup case anch	2	2	1	2	2	-	2	2	2	2	2	1
<b>ADULTS</b>												
38 Anten length	0	2	2	1	1	1	2	1	0	0	0	-
39 M maxil palps	0	0	0	1	0	1	0	0	0	0	1	1
40 Ocelli	1	1	1	1	1	1	1	1	0	1	1	1
41 Facial warts	1	1	3	2	-	-	1	-	1	-	-	-
42 Pronot warts	1	1	0	2	1	1	1	0	0	1	1	1
43 Mesonotal wts	1	4	2	2	1	1	4	3	1	3	4	2
44 Mesoscutel wts	1	2	1	2	2	2	1	1	2	2	1	1
45 Leg spines col	2	2	1	1	2	2	-	-	2	-	-	-
46 Thyrid cell	0	0	0	0	1	0	1	0	0	0	0	0
47 Androconia	1	0	0	3	2	0	0	2	0	2	0	0
48 Discoid cell	0	0	0	0	2	1	-	0	0	0	0	0
49 Median cell	1	1	1	1	2	2	2	2	2	2	-	1
50 Sc R1 joined	0	0	0	0	0	0	0	0	0	0	0	0
51 M Forks FW	1	6	6	6	5	6	3	1	1	2	1	7

52 F Forks FW	1	2	3	3	6	4	5	2	2	-	2	7
53 Wing lobes	0	0	0	0	2	1	1	0	2	1	1	1
54 M Forks HW	1	5	5	3	5	2	6	1	1	-	5	1
55 Wing coupling	1	1	1	1	1	0	3	1	0	1	1	3
56 Parameres	1	0	1	0	1	-	0	-	0	0	1	1
57 M prean app	2	1	2	1	2	3	2	2	2	1	2	2
58 Vagina scler	1	1	1	-	-	1	1	-	1	1	1	1
59 9 stern fused	0	1	1	1	1	1	0	-	1	-	-	-

careful determination of the relationships of the pupae would provide a clearer picture of the placement of the Antipodoeciidae.

The variation of possible character states within certain families of the Sericostomatoidea indicates either a polyphyletic origin for these families or else a convergence of character states. It confirms Wiggins' (1982) findings, that the relationships within the sericostomatoid families have not been sufficiently synthesised and fully resolved. A more detailed analysis of character states within world genera would possibly improve the determination of relationships within this interesting and diverse array of families which are so well represented in the southern hemisphere. More detailed morphological information on larvae, pupae and adults as well as behavioural and life history information are required before a comprehensive analysis of phylogenetic relationships within the Sericostomatoidea can be undertaken. A more rigorous analysis to test character consistency among all genera of the sericostomatoids is necessary before unbiased hypothesis testing of the monophyletic origin of the sericostomatoid family grouping can be performed.

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